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ABSTRACT

The National Assessment of Educational Progress (NAEP) is an information-gathering project that surveys the educational attainments of 9-year-olds, 13-year-olds, and 17-year-olds. The purpose of this report is to attempt to summarize performance across all learning areas for each age group separately. Results were selected to provide a useful and interesting overview of what students know and can do. Each chapter of the report contains information about one of the three age groups. The first part of each chapter, "Summaries of Ten Learning Areas," is devoted to a series of short descriptions of the findings for each subject area. The second section of each chapter highlights achievements attained by students. The lists describe the actual achievements of many students, some students, and few students. Readers must decide for themselves whether these actual achievements are adequate or not. The third section, "Patterns of Group Results," summarizes the results obtained for regions of the country, males and females, blacks and whites, different types of communities, and different levels of parental education. (RC)

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NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS

ED135846

WHAT STUDENTS KNOW AND CAN DO

Profiles of Three Age Groups

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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Education Commission of the States

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WHAT STUDENTS KNOW AND CAN DO

Profiles of Three Age Groups

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TABLE OF CONTENTS

	page
INTRODUCTION	v
CHAPTER ONE: PROFILE OF 9-YEAR-OLDS	1
Summaries of Ten Learning Areas	2
Highlights of What 9-Year-Olds Know and Can Do	25
Patterns of Group Results	29
Changes in Educational Achievement	33
Conclusion	36
CHAPTER TWO: PROFILE OF 13-YEAR-OLDS	39
Summaries of Ten Learning Areas	40
Highlights of What 13-Year-Olds Know and Can Do	65
Patterns of Group Results	69
Changes in Educational Achievement	72
Conclusion	76
CHAPTER THREE: PROFILE OF 17-YEAR-OLDS	79
Summaries of Ten Learning Areas	80
Highlights of What 17-Year-Olds Know and Can Do	103
Patterns of Group Results	109
Changes in Educational Achievement	113
Conclusion	115

INTRODUCTION

Description of National Assessment

The National Assessment of Educational Progress (NAEP) is an information-gathering project that surveys the educational attainments of 9-year-olds, 13-year-olds and 17-year-olds. Although they are not discussed in this report, adults (ages 26-35) are sometimes surveyed. The goal of the assessment is to describe trends in what these Americans know, what they feel about important social and educational issues and what they can do. Their achievements are assessed in ten learning areas: art, career and occupational development, citizenship, literature, mathematics, music, reading, science, social studies and writing. Different learning areas are assessed every year, and all areas are periodically reassessed in order to measure changes in educational achievements.

Each assessment is the product of several years' work by a great many educators and citizens from all over the country. These people design objectives for each area that they feel Americans should be achieving in the course of their education. The objectives are used by exercise (item) writers to create measures of achievement.

When the exercises have passed extensive reviews, they are administered to probability samples of each age group. The people who comprise these samples are chosen in such a way that the results of their assessment can be generalized to an entire national population. That is, on the basis of the performance of

about 2,500 9-year-olds on a given exercise, we can generalize about the probable performance of all 9-year-olds in the nation.

Rationale for This Report

Generally, when National Assessment reports results, the performance levels of all three age groups are discussed for a learning area or for a set of exercises that deals with an aspect of a learning area. Those reports compare and contrast performance across age groups for specific skills, knowledge and attitudes. The purpose of this report is to try to summarize performance across all learning areas for each age group separately.

Since the information summarized in this report is based on seven years of assessment effort, with at least two learning areas assessed each year, all NAEP findings could not be included. Results were selected to provide a useful and interesting overview of what students know and can do.

Organization of the Report

Each chapter of the report contains information about one age group: 9-year-olds, 13-year-olds or 17-year-olds. The first part of each chapter, "Summaries of Ten Learning Areas," is devoted to a series of short descriptions of the findings for each subject area.

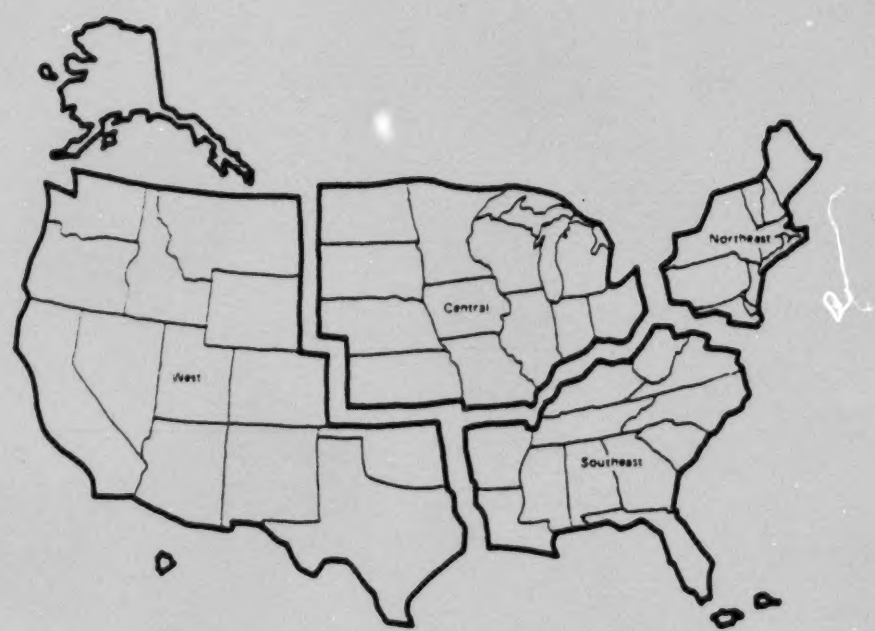
The second section of each chapter highlights achievements attained by students. Since National Assessment tries to describe a broad range of educational attainments, the items are designed with various levels of difficulty. National Assessment does not expect all students to be able to

answer all questions. The lists describe the actual achievements of many students, some students and few students. Readers must decide for themselves whether these actual achievements are adequate or not.

The third section, "Patterns of Group Results," summarizes the results obtained for regions of the country, males and females, blacks and whites, different types of communities and different levels of parental education. The groups are defined below.

Regions

The country has been divided into four regions - Northeast, Southeast, Central and West. The states that are included in each region are shown below.



Sex

Results are presented for males and females.

Race

Currently, results are reported for blacks and whites.

Size and Type of Community

Community types are identified both by the size of the community and by the type of employment of the majority of people in the community.

High-socioeconomic metropolitan. Areas in or around cities with a population greater than 200,000 where a high proportion of the residents are in professional or managerial positions.

Low-socioeconomic metropolitan. Areas in or around cities with a population greater than 200,000 where a high proportion of the residents are on welfare or are not regularly employed.

Extreme rural. Areas with a population under 10,000 where most of the residents are farmers or farm workers.

Urban fringe. Communities within the metropolitan area of a city with a population greater than 200,000, outside the city limits and not in the high- or low-metro groups.

Main big city. Communities within the city limits of a city with a population over 200,000 and not included in the high- or low-metro groups.

Medium city. Cities with populations between 25,000 and 200,000.

Small places. Communities with a population of less than 25,000 and not in the extreme-rural group.

Parental Education

Four categories of parental education are defined by National Assessment. These categories include: (1) those whose parents have had no high school education, (2) those who have at least one parent with some high school education, (3) those who have at least one parent who graduated from high school and (4) those who have at least one parent who has had some post-high school education.

The fourth section of each chapter describes changes in achievement over time for the learning areas of science, reading and writing. These are the first areas National Assessment has reassessed. Citizenship/social studies change data are currently being analyzed and will be reported later this year. Data collection for the third science assessment has been completed. The second assessment of mathematics will begin in October 1977, and other reassessments are now being developed. An assessment time-table follows.

Assessment Year	Areas Assessed
1969-70	Science, Writing, Citizenship
1970-71	Reading, Literature
1971-72	Social Studies, Music
1972-73	Science, Mathematics
1973-74	Writing, Career and Occupational Development
1974-75	Reading, Art
1975-76	Citizenship/Social Studies, Basic Mathematics*
1976-77	Science, Basic Life Skills*
1977-78	Mathematics, Consumerism*
1978-79	Writing, Art, Music
1979-80	Reading, Literature

NAEP is continuing to conduct reassessments in all of the learning areas in order to provide further information about changes in the knowledge, skills and attitudes of young Americans. The assessment's major purpose is to monitor these long-term trends in educational achievement. Future findings will be compared and contrasted with the results discussed in this report. The final section of each chapter discusses our current understanding of the overall strengths and weaknesses of each age group.

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*Small, special-interest assessments conducted on limited samples at special ages.

CHAPTER ONE

PROFILE OF 9-YEAR-OLDS

This chapter presents an overview of the skills, knowledge and attitudes of 9-year-olds. In order to provide this information, the results from the national assessments of 10 learning areas have been studied and summarized in a variety of ways.

The chapter is divided into five major sections. The first and most lengthy part of the chapter is devoted to brief descriptions of performance in each learning area.

The second section, "Highlights of What 9-Year-Olds Know and Can Do," contains three lists of skills, knowledge and attitudes from all the learning areas. The lists highlight achievements attained by many 9-year-olds, some 9-year-olds and only a few 9-year-olds.

The third section describes the patterns of results obtained for males and females, blacks and whites, regions of the country, different types of communities and different levels of parents' education. (These reporting groups are defined in the Introduction.) Next, changes in achievement over time are discussed. The chapter concludes with a brief statement about the overall strengths and weaknesses of 9-year-olds.

Mathematics: Age 9

Nine-year-olds have a limited knowledge of mathematics; however, children of this age have learned some basic mathematical concepts. For example, more than 80% of the 9-year-olds knew the correct order of a set of whole numbers, and nearly as many knew that 6 was the digit in the ten's place in 4,263. About the same number of children knew that 700 + 60 + 2 is the proper expansion of 762.

Three out of four 9-year-olds could write an even number or an odd number. However, fewer than 1 in 10 could seccessfully identify a prime number from among four choices. Most 9-year-olds knew the properties of zero -- nearly all were able to add 3 + 0 to get 3. Almost 90% could subtract 3 - 0 correctly, and nearly as many knew that zero is the product of 3 x 0.

Nine-year-olds are not able to apply computational skills consistently to solve problems. Their performance varied, even on problems that required similar kinds of knowledge and skill. It is clear, however, that 9-year-olds can add best of all; they can subtract better than they can multiply; few are able to divide. Most (79%) of the children could add 38 + 19 and get 57, but on a problem written out in sentence form, 10% fewer could add two-digit numbers that needed no carrying. About 70% of the children could correctly add four numbers, such as 2 + 6 + 11 + 13, but only about 60% could correctly add a series of three- and four-digit numbers.

Subtraction is more difficult than addition for 9-year-olds. All of the subtraction problems required borrowing. Only about half of the students were able to subtract two numbers, such as 36 - 19, correctly. Less than one-third of the children were able to complete each of three subtraction problems, such as 1,054 - 865. A common subtraction error among 9-year-olds was always to subtract the smaller digit from the larger.

Performance on multiplication problems varied as much as performance on addition. One-fourth of the children were able to multiply 38 x 9 correctly. Thirty-five percent solved a similar problem of multiplying a two-digit number by a one-digit number. On still another similar exercise only about 30% did the multiplication correctly, while another 25% simply responded that they didn't know how to do the problem. On other more complex multiplication tasks -- for example, 567 x 412 -- only about 5% of the children were successful.

Division is by far the most difficult of the four computational operations for 9-year-olds. When asked to divide 125 by 5, only 15% of the children gave 25 as their answer. When asked to divide a five-digit number by a single-digit number, only 5% of the children got the correct answer.

Most 9-year-olds are not able to deal with fractions. Less than one-third of the children correctly identified the shaded portions of figures depicting 1/4 of a rectangle, 2/6 of a circle or 2/5 of a circle. Slightly more children recognized 4/8 of a rectangle, but only 20% of the children could identify 1/3 of a circle. Almost none of the 9-year-olds (9%) knew that 9 2/5 is the proper reduction of 47/5.

When asked to read and solve a problem written in a story format, some 9-year-olds are able to respond correctly. One question asked how many pints

of water an astronaut would need for a seven-day space trip if he used three pints every day. Almost half of the 9-year-olds gave the correct answer to this problem. On a similar word problem involving the multiplication of the numbers 5 and 12, almost 70% of the children were successful. Word problems requiring the use of subtraction or division were more difficult for 9-year-olds. Only slightly more than one-third of them could find the number of days it would take a dog to finish a 24-biscuit package if he ate two biscuits every day. Fewer than one-fourth of the children determined that if a rocket aimed at a target 525 miles south of the launch point actually landed 624 miles south of a launch point, it had missed its target by 99 miles.

Most 9-year-olds could tell time on a clock when the minute hand was at either 15 or 30 minutes past the hour, and nearly all of them could give the time when it was shown to be on the hour. Almost all children correctly read a temperature that was at a 10° gradation on a thermometer scale, but less than 20% were able to read a temperature between the 10° gradations on a thermometer graduated in two-degree intervals. When using a ruler, 9-year-olds could measure to the half-inch but had trouble discriminating eighths of inches.

Most of the geometry items given to 9-year-olds involved identification of terms. Nearly all could name a circle and a triangle, but only about one-fourth could identify a cone, sphere or ellipse. Almost half of the children could select a pair of parallel lines from a set of several different configurations of line pairs, but only 20% of them successfully drew a line parallel to a given line. About one-third of the children could select a right angle from the alternatives of right, acute and obtuse angles.

likely in most of the United States. However, fewer than 10% knew that, when trying to determine the outdoor temperature, a person should put the thermometer in a shaded place.

Nine-year-old knowledge of plants and animals varies considerably. About 60% chose cocklebur from among four seeds as the one most likely to be spread by sticking to animals. Most of the 9-year-olds knew that a fish is an animal with scales over most of its body, and almost all (95%) knew that a rabbit is an animal that eats only plants and that penguins cannot fly. More than two-thirds recognized that an animal is probably frightened when it breathes faster and its heart beats faster. About half of the children knew that germs can cause disease in man by making poisons and that houseflies can spread serious human diseases. Very few children (16%) knew that sweating helps to cool a person's body.

Most (88%) of the 9-year-olds knew that you must find where the air leaks out of a bicycle tire in order to fix it. About two-thirds knew that iron is likely to rust when it is damp, and about the same number knew that blowing on a campfire is a way to speed up the burning of the fire. About as many knew that when sand and salt are put together they become a mixture. Less than 20% of the 9-year-olds chose an atom of iron as being the smallest possible form of iron.

Almost two-thirds of the 9-year-olds chose "1 pint" as the space taken up by a rock if the water level in a container went from 5 to 6 pints when the rock was put into the container. However, only one-third recognized that the water level would remain the same when the rock was removed, broken into three pieces and returned to the water. About 20% chose the option that showed the water level being higher than before.

In summary, most 9-year-olds are familiar with whole numbers, number sequences and the arithmetic properties of zero. Also, most 9-year-olds have learned to tell time on the hour, half hour or quarter hour. Children in this age group know about triangles and circles, but are unfamiliar with other geometric forms.

Very few children can successfully solve problems dealing with multiplication, division and fractions. The 9-year-olds have some degree of familiarity with the manipulation of numbers in addition and subtraction problems, but their variable performance on these tasks indicates that they have not yet fully mastered these skills.

Science: Age 9

Many 9-year-olds know a number of basic facts about the earth, solar system and universe. Almost all of them understood that the sun is hotter than Mars, the earth and the moon. Most (76%) chose "more than have been counted" when asked the number of stars in the universe. Two-thirds of the children knew that the earth moves around the sun once in each year, but only one-third could use a simple apparatus to demonstrate the yearly and daily earth cycles. Only about 40% of the 9-year-olds knew that most of the earth's surface is water or knew that fossils of the bones and shells of sea animals that lived millions of years ago would be found in rocks.

Nine-year-olds knew some basic facts about weather. About 80% of them understood that clouds in the sky are a necessary condition for rain and that snow is a likely result of cold and cloudy weather. About 60% of them selected January as the month in which a noon temperature of 30°F is most

Nine-year-old percentages of success were somewhat inconsistent on the following two questions about averaging temperatures. In a multiple-choice item in which they were asked the temperature of water just after mixing a pint at 50° and a pint at 70°, only about 6% correctly answered 60°. Seventy-two percent of the children said 120°. In another item they were given two beakers, each having the same amount of water -- one hot and the other cold. Again they were asked what the temperature of the mixture would be, and about 7% indicated that it would be the average of the two temperatures. However, on this problem 42% did indicate that the temperature would be somewhere between the hot and cold temperatures.

Nine-year-olds seem to have limited knowledge about scientific methods. Fewer than half of the children recognized that if one wanted to compare the growth of seeds under two different conditions, then the same kind of seeds had to be used in both conditions. Only 25% of the 9-year-olds selected "no topic" as the topic that scientists know everything about -- 30% selected the stars, and another 25% chose trees. Only about one-fourth of the children knew that scientific laws come from many experiments, while more than one-third thought that these laws were passed by Congress.

In summary, most 9-year-olds have some basic understanding of characteristics of plants and animals, the solar system and weather. Some know about biological and physical science topics such as spreading of disease and rusting of metals. Most children lack knowledge about general scientific methods. They also do not seem to understand facts about relationships and properties, such as the cooling effect of the evaporation of perspiration or the property of volume of solid objects.

Career and Occupational Development: Age 9

Most 9-year-olds are familiar with several types of jobs and careers. Most (85%) could select newscaster when asked to identify the job after hearing a description of it. In fact, about 60% of the children correctly identified all five jobs (newscaster, nurse, mailman, secretary, and service station attendant) after hearing and seeing verbal descriptions. About 80% of the children could give at least one work duty for such visible occupations as a mailman, storeclerk, policeman and teacher.

An important goal of career education is that students learn to evaluate their own goals and abilities and form realistic occupational plans. Almost all 9-year-olds were able to identify one or more things they did well, one thing they did not do well and one thing that they enjoyed doing. Most (84%) were also able to name activities that they did not enjoy doing. Almost two-thirds of the 9-year-olds said they had asked for advice on ways to improve at some activity that they enjoyed doing.

Most 9-year-olds have had some work-related experience. Almost all have helped out at home. Nearly all (97%) have visited a library. Eighty percent or more have visited a zoo, a museum, an airport or a farm. Sixty percent have visited a factory and about half have visited a dairy and an aquarium. About half of the children have taken several kinds of lessons outside of school; the most common lessons were in music, art and individual sports. Nine-year-olds were asked if they had done a number of activities by themselves without help. Most (about 85%) had written a letter, washed dishes or painted some object other than a picture. Two-thirds had used a card catalog in a library and about the same number had built something out of wood and repaired a bicycle or a wagon. About one-third had baked a cake or pie.

Many 9-year-olds understand how to work with others responsibly. When asked what they would do if their school made a new rule that they thought was unfair, about three-fourths of them gave acceptable responses showing involvement and initiative, but one-fourth said they would obey the rule with no attempt to have it changed. The children were also asked what they would do to get help if they were the only person given a job and they didn't understand what they were to do. More than half replied that they would ask questions of the person who had given them the assignment.

In summary, most 9-year-olds have some understanding of the duties performed in certain visible jobs. They also are able to identify some of their own strengths and weaknesses. This type of self-awareness is necessary for them to appropriately evaluate and match their own characteristics with characteristics of potential jobs. Many children have a wide variety of job-related experiences in working at home, visiting businesses and other job sites and taking lessons in order to learn new skills.

Citizenship/Social Studies: Age 9

Nine-year-olds are willing to help others. For example, in a hypothetical situation 80% chose to stay with a friend who got hurt on the way to school, knowing that they would be late to school - most even suggested a practical thing to do. Three-fourths of the children said they had helped a grown-up recently and were able to name the grown-up and tell what they did. Also, 9-year-olds are generally tolerant of those who are different. Most children were interested in people with cultural differences, were sympathetic toward the handicapped and were willing to be friends with or live in the same neighborhood with people of different skin colors. However, half of the

children were hesitant about having people of different skin colors in positions of authority. Although 9-year-olds were familiar with contributions of famous blacks to our nation, they were not generally familiar with the contributions of other famous minority persons.

Nine-year-olds tend to support constitutional rights of individuals regardless of their skin color, life-style, education, sex, religion or level of affluence. However, the amount of support ranged from over 90% for the rights of a factory worker to less than 50% for the rights of an atheist, and few of the 9-year-olds showed tolerance and understanding in all situations. Only half the 9-year-olds believed that sex, education and income should not affect one's right to vote. In addition, a large number believed that there is a law requiring all adults to vote. They were also confused about freedom of speech and the right to trial by jury; only one-third understood that these rights are guaranteed by the U.S. Constitution. Most of the children understood that persons can move from state to state without asking permission from the government.

Nine-year-olds have a general belief in the law, authority, and going along with others' decisions. Almost all of the children thought rules are necessary in school. Half stated that rules were necessary to protect them from physical injury. Most felt that grown-ups also need rules and they saw the need for police. Almost all thought it important to obey the law, although 70% knew a law could be changed. Seventy-eight percent felt an unfair law should be changed; over half said they personally would do something about an unfair rule in the classroom.

Two-thirds of the 9-year-olds said they enjoyed participating in decisions, but less than half said they actually made decisions in their peer

group. Many understood the concepts of sharing and compromising in peer group situations, and well over half were able to relate the concepts to an international setting. Over half of the 9-year-olds said that one should conform to peer group desires rather than stand up for one's beliefs.

Nine-year-olds are not very interested in politics. About half said they liked to learn about government; less than one-third liked to watch television programs about elections and politics. Only one-third knew that it is not against the law to have more than two political parties. Less than 10% said they often discussed politics in their classes.

Many 9-year-olds do not know specific facts about U.S. government, history, geography or economics. Half knew that the federal, state and local governments have different functions. Within the federal level, three-fourths knew the basic function of the judicial branch, but only one-third could distinguish between the functions of the executive and legislative branches.

Almost all could identify a picture of the President, most knew his name and about 70% could explain generally how he is chosen. Over half knew that the mayor is head of a town, but only a few knew that the head of a state is called a governor. Nine-year-olds were confused about specific functions and powers of the President. Eighty percent said the President must obey the law, yet half felt he had the right to do anything he wanted to. About 40% maintained that the President should have the right to censor the media; only half knew he does not have this right.

Nine-year-olds only vaguely understand some basic principles of economics. Half knew that parents pay taxes to the government for the government to provide services such as roads and policemen. Half were familiar with credit

-- that you can have things now and pay for them later. However, 9-year-olds did not understand other economic principles such as wage/price relationships, retail profit, division of labor and supply and demand.

On a series of items dealing with place-name geography, half of the 9-year-olds showed familiarity with certain world and national geographic locations. More knew whether or not certain rivers were in the United States than knew general locations of states. Three-fourths knew the name of the state in which they lived; however, only two-thirds knew the name of the country or the number of states in the United States.

Some 9-year-olds have a general sense of historical time. Half could place such inventions as the printing press, compass and telegraph before or after Columbus. When it came to specific facts, results were varied. Most knew the first President of the United States, but in response to "The American Revolution was a war to win our independence from which country?" only 60% selected England.

Many 9-year-olds have learned how to obtain information and some know how to interpret information. Three-fourths of the 9-year-olds were familiar with the appropriate uses of basic reference materials such as dictionaries and encyclopedias, but fewer were successful in using a table of contents. Two-thirds could distinguish relevant from irrelevant information. Half could determine whether or not a generalization lacked supporting evidence and the same number recognized that some statements can be proved and others cannot.

In summary, 9-year-olds are concerned about others and generally support the rights of others, even though they do not know that the Constitution guarantees those rights. They are not, however, assertive about their own rights. They recognize that unjust rules can be changed, but are unlikely to

initiate changes or to stand up for their beliefs against the peer group. Nine-year-olds have some understanding of the structure and function of federal, state and local governments. They are familiar with the President, but not with his powers; they understand the basic function of the judicial branch, but have only a vague notion about what Congress does. Some 9-year-olds understand the mechanics of taxation, know some place-name geography and have a general sense of history.

Reading: Age 9

Many 9-year-olds have literal comprehension reading skills that enable them to understand facts in simple, brief stories and other reading materials. For example, 90% of the children understood a story stating that a girl couldn't find a lost object because it was hidden under something. About the same percentage could select the sentence that described the relationship between two objects shown in a picture. Eighty percent of the children could read four cereal boxes and determine which box had a toy inside. The same number could read a six-sentence story and remember what certain characters in the story were doing.

In another literal comprehension task, fewer children (66%) could read four rearrangements of an original sentence and determine which of the four meant the same as the original sentence. Two-thirds of the 9-year-olds were able to follow a set of written instructions that asked them to connect certain dots and to write a number in a specific place on a page. However, only half as many (32%) could read three paragraphs of instructions on a can of cat food and determine how much food was to be given to a two-month old kitten.

Other reading tasks measured 9-year-olds' inferential reading skills, and the results varied as much as results on literal comprehension. Most 9-year-old children (90%) could read three- or four-sentence descriptions of people or things and infer how the person was feeling or what object was being described. More than three-fourths of the children could identify the object described in a collection of sentences that had a nonsense word used in place of the name of the object. However, only 37% understood that a paragraph about a common bug was an exaggeration or tall tale, and fewer still (27%) were able to read a three-paragraph story about explorers at the South Pole and select the most appropriate title from a set of four possible titles. The same proportion of children were able to read four simple sentences and determine which of the four didn't belong with the others because it was about a different topic.

The 9-year-old's knowledge of resource materials and how to use them is quite varied. Only 60% of the children knew that an encyclopedia is a good resource to use to get information about the Declaration of Independence. On the other hand, about 80% of the children knew that a dictionary is used to locate the meanings of words. Ninety percent of the children had two-letter alphabetization skills, but only 40% could use three-letter alphabetization skills in a task involving four sets of guide words from dictionary pages.

In summary, many 9-year-olds can read short descriptions of persons, objects or events and understand, at either a literal or inferential level, what is being described. However, very few children have the skills necessary to read and understand a long set of instructions. It is also difficult for 9-year-olds to understand the main idea of a passage or to detect that a

sentence doesn't belong with other sentences because it is about a different topic. Many children understand the use of a dictionary, but fewer are familiar with the potential usefulness of an encyclopedia.

Literature: Age 9

Three-fourths of the 9-year-olds reported that they often spend free time reading for enjoyment. Only 16% said they never read for enjoyment. They most often read "stories about real people" and "stories about real things that have happened". Two-thirds were able to tell the name of a book they had read -- mostly adventure and fantasy books. In addition, one-third were able to name at least one poem, and about the same number were able to name a biography they had read. About half reported that they had read magazines and most were able to give magazine titles. Twenty-two percent named children's magazines with stories, such as Jack and Jill.

Many 9-year-olds are familiar with characters from fairy tales. For example, 86% recognized Little Red Riding Hood and half were able to offer a description of Rumpelstiltskin. Almost half recognized other fictional characters such as Alice in Wonderland and Winnie the Pooh; half could describe Paul Bunyan. Most 9-year-olds could describe Daniel Boone, but they did not know the Norse god Thor.

Some 9-year-olds have a basic understanding of poetry. In addition to being able to give titles of poems they had read, over half were able to read poems with some understanding. When given poems with omitted lines, a majority of the children could choose the most appropriate line to complete the poem. They were even more successful at understanding simple metaphors. Generally,

about three-fourths of them were able to read metaphors and answer questions about them. Nine-year-olds had difficulty understanding puns, even though directions for the question were very complete and included examples. The children were given five statements and asked to mark which were examples of puns and which were not. Although many marked at least one statement correctly, one-third of the children did not mark any of the statements correctly.

Most 9-year-olds are unable to give thoughtful reactions to stories or poems. For example, after they listened to and read Sam, Bangs, and Moonshine, they were interviewed about what they thought about the story. Most students responded with a simple opinion. Comments that were personal in nature, describing the effect of the story on the student, were usually meaningfully stated. The rest of the comments consisted solely of "It was pretty good", or a similar remark. Only 22% of the 9-year-olds gave elaborated, substantive responses. On other tasks requiring a "response to literature", the proportion of adequate responses was even lower.

In summary, 9-year-olds enjoy reading and read often. Some have developed an understanding of poetry. However, as could be expected, they seem to be most familiar with fairy tales and books or stories written primarily for entertainment. It is not surprising, then, that they evaluate literature primarily in terms of its entertainment value. Most of the children respond to stories by discussing how involved they become in the story or how interesting the content is to them.

Writing: Age 9

Nine-year-olds find it difficult to organize and structure their thoughts in writing. The quality of organization in their writing depends on the nature and complexity of the task.

One writing task was specifically designed to determine what structural or oganizational methods students would adopt in a nondirective, unstructured writing situation. They were asked to listen to Scott Joplin's "New Rag" and write about "whatever the music brought to mind." Only 10% of the children wrote well-organized essays. Another 4% wrote papers with rudimentary structure; they usually wrote a series of small clusters, each of which contained one idea with two or three related details. The majority of 9-year-olds wrote lists of unelaborated items, making no effort to link statement to statement or to create a coherent explication of their reaction to the music.

Another task, this one highly directive, was designed to assess sentence- and idea-ordering abilities. The children were given five facts about the moon and asked to write a report based on these facts for their science class. They were instructed to report the facts "in an order that would be clear and would make sense". Even with this explicit direction and time to revise their reports, over half of the 9-year-olds could not complete this exercise satisfactorily. Instead, they frequently responded by listing facts in a random order or listing them in a logical order but without transitions or explanatory detail. Sixty percent attempted to revise their reports. Even though about half of them made specific mechanical, grammatical, and informational changes, the revisions generally did not improve the logical order of the reports.

The results on the "moon report" task were particularly interesting in comparison with the results on the "music" task discussed previously. It appears that the explicitness of the instructions has a significant effect on the quality of children's writing. In the more directive moon report 25% wrote small clusters of connected information and 50% wrote lists; in the non-directive music task only a small percentage wrote clusters and 75% wrote lists. The specific directions helped the students to use rudimentary forms of organization; however, no matter what the directions were, the same number wrote well-organized responses.

The quality of 9-year-olds' writing also improves as the writing tasks become more interesting and engaging. For example, when children were asked to assume the role of a tennis shoe, 50% of the children included enough structure and detail to develop distinct tennis shoe personalities in their essays. Similarly, after being shown a picture of a kangaroo and asked to write a story about where the animal was going or what it was doing, half of the 9-year-olds were able to write paragraphs with interconnected sentences and ideas. These paragraphs did not leave the reader confused about the order of the ideas or the relationships of the ideas to one another.

One general characteristic of 9-year-old writing is brevity. Most children write only a few sentences, and they rarely elaborate. For example, the kangaroo stories, which seemed to draw the children's interest, averaged only five sentences (55 words) per story. The shortness of the stories seems to reflect the inability of the average 9-year-old to expand upon ideas. The children tended to write by listing general topics, rather than by stating one idea and expanding it with supporting details and modifications.

Since the essays are brief and about half of the sentences are simple, it is difficult to make inferences about 9-year-olds' writing mechanics skills. The children do not write enough to permit many different types of errors. However, most of their writing was free of agreement, punctuation and word choice errors. On the other hand, approximately 10% of the words were misspelled, at least one of the sentences was awkwardly written and there was likely to be either a sentence fragment or a run-on sentence.

Letter-writing skills and knowledge of letter-writing conventions were also measured. About 70% of the 9-year-olds included a greeting in their letters, but only half provided a closing or a signature. Over half seemed to be familiar with the contents and format of addresses. Almost all 9-year-olds successfully wrote a short "get-well" note to a friend, but very few could write to order a product from an advertisement.

In summary, many 9-year-olds appear to have learned some basic writing mechanics skills. They are familiar with the basic conventions of letter writing and can write letters to friends. When writing essays they use simple sentences, and attempts at complex sentence constructions meet with mixed success. A large proportion of 9-year-olds have difficulty ordering ideas, elaborating on ideas and providing transitions from one thought to another, particularly if the writing task is complex.

Music: Age 9

Many 9-year-olds can improvise rhythms and follow rhythmic patterns while singing a familiar song. About half of them can improvise a melody as a concluding phrase when given an unfamiliar introductory phrase, and about

the same number can sing a familiar song on pitch. For example, when asked to sing "America" accompanied by a chorus of voices, 93% of the children sang with accurate rhythm, and fifty percent sang the melody acceptably, with only a few pitch errors. When the chorus of voices stopped singing and the children were required to finish the song on their own, the percentages of acceptable responses dropped to 80% for rhythm and 40% for pitch.

On another task, the 9-year-olds were asked to listen to a four-bar rhythmic pattern and then tap out the pattern themselves. Thirty percent of the children accurately recalled and reproduced the rhythm.

By far the most difficult performance task for the 9-year-olds was singing from musical notation. Only 5% of the children could sing correct pitch relationships, and only 2% could sing the correct rhythm.

Twenty-five percent of the children said they played musical instruments. In the assessment, 15% played a selection of their own choice, and about half of them gave adequate or good performances. Many of the 9-year-old instrumentalists played keyboard instruments. Nearly all of those who said they could not play an instrument said they would like to learn.

About three-fourths of the 9-year-olds believe that singing in either small or large groups is enjoyable, but only 22% of them belong to a singing group. Similarly, about 60% of the children think that playing an instrument in small or large groups is enjoyable, but only 8% of them belong to an instrumental group.

Nearly all 9-year-olds recognized a line of music when they saw it, but less than half of them knew the names of the treble clef or sharp and flat symbols. About half of the children were familiar enough with musical

conventions to match a recording of "Are You Sleeping?" with its line of musical notation. Fewer children (20%) were able to match a line of notation to a recording and mark where the music stopped. About half of the 9-year-olds could detect when the melody line in a piece of music was moving up and down and whether the pitch movement was taking place in steps or skips. Nearly as many recognized that two pieces of music were different because the melody, rather than the harmony or rhythm, had been changed.

Although most 9-year-olds recognized the sound of a piano and a trumpet and about 60% recognized a piccolo, only a few recognized a saxophone. Over 80% of the children knew whether certain instruments are played by blowing, striking or plucking. The children were least sure about how the oboe (75%) and the banjo (70%) were played.

Over 60% of the 9-year-olds said they listen to music on the radio several times a week, and about half of them listen to records or tapes. About 30% of the children said they liked to listen to rock music, about 20% mentioned "music like the kind they sing in school", and only a few mentioned jazz, folk, country-western or classical music.

In summary, most 9-year-olds are familiar with the sounds and names of many common instruments, and about half of them have learned to listen to music and discriminate patterns in melodies. Most 9-year-olds enjoy singing and listening to music, but although many show an interest in singing or playing in organized music groups, only a small percentage of children actually engage in these activities. Many 9-year-olds are able to "sing along" on familiar songs. It is rare to find a 9-year-old who has learned to sing or play from musical notation.

Art: Age 9

At the present time results are available from four drawing-skill exercises in the art assessment.* Two tasks measured the 9-year-old's ability to draw objects in perspective; one task involved making a pencil drawing of a person running very fast; and the other called for creating a design.

In one perspective drawing task, children were asked to draw three children on a playground, making one child seem very close, the second child seem farther away and the third child seem very far away. Successful drawings had the three figures drawn progressively higher and appropriately smaller as well. Slightly more than 40% of the children successfully portrayed depth and distance in their drawings. More than three-fourths of the children drew the figures progressively higher in the picture, but less than half made the figures appropriately smaller. Less than one percent of the 9-year-olds used the technique of having figures overlap each other to show depth.

Only 23% of the children successfully completed the more complex perspective task of drawing a picture of four people seated at a table. Each drawing was scored for 14 perspective characteristics. If a drawing included at least 7 of these features it was classified as successful. One-third of the children correctly drew the table top with converging lines; another 10% drew diverging lines that reversed the perspective; the rest of the children showed the table either from a bird's-eye view or in an eye-level profile view.

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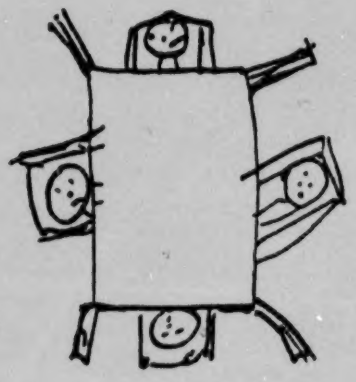
*National Assessment reports about knowledge of art history and about attitudes toward art will be available later this year.

One-third of the 9-year-olds used the perspective technique of having the table overlap a figure, but only half as many had a figure overlapping the table. About 40% of the drawings showed distance by having the near figure lower on the picture plane than the far figure. Only about 10% of the children drew the back legs of the table and chairs shorter than the front legs. An example of a 9-year-old drawing is shown below.



The 9-year-olds were also asked to create an artistic design to cover a bedroom wall that had an off-center door. Forty percent of the children created a design that "fit artistically" within the shape of the wall. About one-third of the designs were drawn with the elements of the design related to each other in an integrated, coherent or consistent manner. Only 12% of the drawings included the door as an integral part of the overall design.

Only 21% of the children were able to draw a picture of a person running very fast. In order for the drawing to be scored as portraying motion, the human figure had to be leaning in the appropriate direction with arms and legs bent and pointed in the appropriate directions. Expressive devices such as speed lines or having the figure running above the ground as if flying were

also scored as helping to depict motion. More than 80% of the children drew an arm bent in the appropriate manner, but only 25% drew one or both legs bent appropriately. The same number drew the body leaning in the direction of the motion. One-third of the drawings contained at least one special expressive device such as flying hair or speed lines.

In summary, slightly less than half of the 9-year-olds have the artistic skills necessary for successfully creating a design to fit the shape of a wall. About the same number are able to portray depth and distance in a drawing of three children on a playground. However, only one-fourth of the children can successfully show perspective with the use of converging lines and overlapping objects in a picture of four people seated at a table. About 20% can successfully manipulate the elements of human form to depict motion.

Highlights of What 9-Year-Olds Know and Can Do

The following statements summarize the findings about what many 9-year-olds (more than two-thirds) know and can do.

- Many know the difference between even and odd numbers.
- Many know the properties of zero.
- Many can add two-digit numbers.
- Many can tell time.
- Many know there are more stars in the universe than have been counted.
- Many know that clouds are a necessary condition for rain and that snow is a likely result of cold, cloudy weather.
- Many know that penguins cannot fly, that fish have scales and that rabbits eat only plants.
- Many know the names and descriptions of some common jobs.
- Many can identify some things they do well and other things they do not do well.
- Many have gained work-related experiences by helping out at home and by visiting libraries, zoos, museums and airports.
- Many are willing to help others.
- Many are interested in people with cultural differences.
- Many support constitutional rights.
- Many believe that rules, laws and police are necessary and that it is important to obey the law.
- Many understand that unfair rules and laws can be changed.
- Many know that judges preside at trials.

- Many know who the President is and generally how he is chosen.
- Many understand the concepts of sharing and compromising in peer group situations.
- Many are familiar with the appropriate uses of dictionaries and encyclopedias.
- Many can read and comprehend literal facts in simple, brief stories.
- Many can read short descriptions of people or things and infer how the person was feeling or what object was being described.
- Many have two-letter alphabetization skills.
- Many read books and stories on their own.
- Many are familiar with characters from fairy tales.
- Many can write without making punctuation, agreement or word choice errors.
- Many are familiar with the basic conventions of letter writing and can write letters to friends.
- Many can improvise rhythms and follow rhythmic patterns while singing.
- Many are familiar with the names and sounds of most musical instruments.
- Many believe that singing is very enjoyable.
- Many can draw in perspective by having figures shown progressively higher on the picture plane.
- Many can draw a running person's arms in appropriate positions.

The following statements summarize the fundings about what some 9-year-olds (approximately 33% to 67%) know and can do.

- Some can add a series of three- and four-digit numbers.
- Some can subtract two-digit numbers.
- Some can do single-digit multiplication word problems.

- Some know that the earth's surface is mostly water.
- Some know what fossils are.
- Some know that disease can be spread by insects.
- Some know that iron is likely to rust if it is damp.
- Some believe that every person's vote should count equally in an election.
- Some understand that the federal, state and local governments have different functions.
- Some know that the mayor is the head of a town.
- Some know that the President does not have the right to censor the media.
- Some understand taxation and credit buying.
- Some know where the states are located geographically.
- Some know that there are 50 states in the United States.
- Some have a general sense of historical time.
- Some have three-letter alphabetization skills.
- Some know about a variety of literary works and characters.
- Some are able to write thank-you notes.
- Some can compose essays when given explicit instructions.
- Some can sing familiar songs on pitch.
- Some know the names of musical symbols.
- Some can draw in perspective by showing distant objects smaller than near objects.
- Some can create an artistic design.

The following list summarizes the findings about what few 9-year-olds (less than one-third) know and can do.

- Few are able to subtract three- and four-digit numbers.
- Few are able to do multiplication and division.
- Few understand fractions.
- Few know what an atom is.
- Few know how scientific laws are developed.
- Few are familiar with the contributions of minority people to society.
- Few know the basic functions of the executive and legislative branches of government.
- Few know that the head of a state is called a governor.
- Few know that there are certain constitutional rights guaranteed to all individuals.
- Few understand the economic principles of supply and demand and division of labor.
- Few can understand detailed written directions.
- Few can determine the main idea in a reading passage.
- Few understand puns.
- Few can express a thoughtful reaction to a piece of literature.
- Few can organize and elaborate ideas in writing.
- Few can revise their own writing to improve its overall organization.
- Few can write essays free of misspelled words, sentence fragments and run-on sentences.
- Few can read musical notation.
- Few can use converging lines and overlapping objects to show perspective in a drawing.
- Few can draw a person running.

Patterns of Group Results: Age 9

Regions

Southeast. Children in the Southeast region had strong positive attitudes toward music and were heavily involved in music. They also claimed to read literature often. In these areas their performance was higher than the nation as a whole. In all other learning areas assessed the Southeastern performance levels were below the nation as a whole, and usually the performance was lower than any of the other three regions.

West. The performance levels of children in this region were almost always slightly below the national levels. Their highest performances were on geometry and probability and statistics in mathematics, writing down telephone messages, knowledge in citizenship/social studies, knowledge in literature and perspective drawings in art.

Central. Nine-year-olds in the Central region usually performed better than the nation. They performed better than children in the other three regions in reading and literature; probability and statistics, geometry and variables and relationships in mathematics; job knowledge, work-related skills and self-appraisal skills in career and occupational development; and the design and playground perspective drawing tasks in art.

Northeast. Children in the Northeast region always performed above the nation as a whole. They had the most overall knowledge of science, mathematics

and citizenship/social studies. They also performed better than the other regions in the career and occupational development skills areas of written communication, computation and measurement and use of graphic and reference materials.

Females and Males

Females. Females outperformed males in all aspects of reading, writing and literature. Females also tended to outperform males on those exercises in other subject areas that required writing skills -- namely, career and occupational development job-related writing tasks and citizenship/social studies exercises requiring them to express their attitudes. Females' reading skills may have been a factor in their superiority in the information-gathering and interpretation tasks in the social studies skill area. Females tended to express more positive attitudes than males in all subject areas measuring attitudes: music, citizenship/social studies, literature and career and occupational development. Although females were superior to males in music performance, males and females were equally knowledgeable about musical instruments and music literature and history.

Males. Males clearly knew more about science and mathematics, with the exception of numbers and numeration. Males tended to outperform females in all exercises requiring knowledge in the following subject areas: citizenship/social studies, career and occupational development, science and mathematics. Literature was the only area in which males had less knowledge than females, and music was the only other area in which the males' knowledge

did not exceed the females' knowledge. Males performed better than females on the drawing of a running person in the art assessment.

Blacks and Whites

Blacks. Black children performed below the nation as a whole in all subject areas with three exceptions: attitudes toward music, music performance and the survey of reading habits included in the literature assessment. The exercises on which the black children tended to perform next best -- although below the national levels -- were the attitude items in citizenship/social studies. The gap between the black children and white children was generally about 12 percentage points.

Whites. White children performed better than the nation as a whole in all areas assessed except in attitudes toward music, music performance and the survey of reading habits in literature.

Size and Type of Community

Among the size-and-type of community classifications, the pattern of results remained the same across all learning areas. Students whose schools were in high-socioeconomic metropolitan areas (high metro) areas always performed better than the nation as a whole. They performed exceptionally well on knowledge questions. Students in low-socioeconomic metropolitan (low metro) schools always performed least well. Low metro area students performed better than usual on questions about citizenship/social studies attitudes, items asking them for the "response to literature," questions

about attitudes toward and involvement in music and the "moon report" writing task. Students living in small- and medium-sized cities performed about the same as children nationally. Nine-year-olds living in very rural areas tended to perform slightly below the nation as a whole.

Level of Parental Education

The performance of 9-year-olds was directly related to the amount of education their parents had. Those whose parents had no high school education were consistently the lowest performing group. Those who had at least one parent with some high school education generally performed somewhat below the nation but better than those whose parents had no high school education. Those with at least one parent who graduated from high school generally performed somewhat above the nation, and those with at least one parent who had some post-high school education performed the best.

Changes in Educational Achievement: Age 9

At the present time, National Assessment has completed reassessments in the areas of science, reading and writing. The change data indicate that there has been a significant national decline in science knowledge, a significant increase in reading abilities and a slight improvement in writing abilities.

Science Change

From 1970 to 1973 the proportion of 9-year-olds who knew the answer to a typical science question dropped about two percentage points. The performances of children in the Northeast, Central and Western regions all declined. The 9-year-olds living in the Southeast did not show a decline, but their performance level remained below the levels of the other three regions. The black children in the Southeast were the only group that showed significant improvement.

Performances of males, females, blacks and whites dropped approximately the same amount as the national performance.

While the performance of the high metro group went down by about the same amount as the nation, the low metro performance stayed at the 1970 level. The performance of 9-year-olds living in extreme rural areas improved slightly between 1970 and 1973.

Reading Change

Between 1971 and 1975, 9-year-olds' reading abilities improved across a variety of tasks. The improvement in literal comprehension was a national trend, which held for nearly all reporting groups. Students in the Southeastern region and black students across the country showed significant gains. The greatest improvement by far was shown by 9-year-old blacks in the Southeastern region.

Inferential comprehension skills also improved for nearly all groups. The 9-year-old blacks, as well as students from small towns, showed the greatest increases.

Performance on the study skill/reference source items improved by two percentage points for the nation as a whole. Both black students and white students improved significantly. Large gains were shown by students in the Northeastern region and by students living in small towns.

Writing Change

The 9-year-old in 1974 wrote just as well as, if not slightly better than, the 9-year-old did in 1970. Change measures were collected across a variety of tasks -- from essay writing to letter writing, from addressing envelopes to taking messages.

The essays from one writing task were scored for sentence and paragraph structure and mechanical correctness and each essay was also given an overall rating based on the quality of the whole essay, disregarding specific aspects of style, content or mechanics.

In 1974 there were fewer papers with poor overall ratings and more good papers. The 1974 essays appeared to be somewhat better than the 1970 essays, but the difference in average ratings between the two years was not statistically significant.

During the four-year period, the average essay gained 10 words, or about one sentence. This additional length, however, was accompanied by a loss of paragraph coherence. In 1970 an average of 57% of the paragraphs written by each 9-year-old were coherent; in 1974, the proportion was 43%. Apparently, the extra sentence written by 9-year-olds in 1974 often did not contribute to the paragraph in which it appeared.

Although the types of sentences in the average essay remained about the same, there was a small increase in the proportion of complex sentences (with and without phrases) and an even smaller increase in the proportion of run-on sentences. The percentage of awkward sentences in the average essay dropped considerably. There was little change in the proportion of spelling, punctuation and word choice errors.

On other types of writing tasks the changes in performance between 1969 and 1974 were also slight. There may have been a slight increase in the ability to take telephone messages, but there was no significant change in the overall ability to write social or business letters. Nine-year-olds in both years were much more successful when writing to friends and family than when writing to strangers. There was a decline in the ability to format a letter correctly, but an increase in the tendency to include the zip code in an address.

Conclusion: Age 9

The results of assessments in all of the learning areas indicate that 9-year-olds have learned many things in their first few years of schooling. They know specific facts about a variety of subjects and have learned many basic reading and writing skills. They have learned important socially-accepted attitudes. They are tolerant of people's cultural differences and they believe in an orderly society. In addition, they are interested in having new experiences and learning new things.

Few 9-year-olds have learned to apply their recently-acquired knowledge and skills to new situations. They are seldom able to read or write elaborated material and are often unable to understand difficult concepts or construct relationships between ideas. Sometimes they appear to have contradictory understandings and beliefs about a concept. Although they express interest in being involved with new things, they are not apt to initiate action toward this end.

Some groups of children, such as those in the Northeast, those in high-socioeconomic metropolitan areas and those who are white, generally perform above the national level. Those living in the Southeast, those living in low-socioeconomic metropolitan areas and those who are black consistently perform below the national level.

Data from the reassessments of learning areas indicate that the reading and writing skills of 9-year-olds have improved over the past seven years.

Specifically, reading data show that during the early 1970's the reading skills of black children and children living in the Southeast have been improving at a faster rate than that of the nation as a whole. Also, children in the Southeastern region have not declined in science performance, while nearly all other reporting groups have shown declines.

CHAPTER TWO

PROFILE OF 13-YEAR-OLDS

This chapter presents an overview of the skills, knowledge and attitudes of 13-year-olds. In order to provide this information, the results from the national assessments of 10 learning areas have been studied and summarized in a variety of ways.

The chapter is divided into five major sections. The first and most lengthy part of the chapter is devoted to brief descriptions of performance in each learning area.

The second section, "Highlights of What 13-Year-Olds Know and Can Do," contains three lists of skills, knowledge and attitudes from all the learning areas. The lists describe achievements attained by many 13-year-olds, some 13-year-olds and only a few 13-year-olds.

The third section describes the pattern of results obtained for males and females, blacks and whites, regions of the country, different types of communities and different levels of parental education. (These reporting groups are defined in the Introduction.) Next, changes in achievement over time are discussed. The chapter concludes with a brief statement about the overall strengths and weaknesses of 13-year-olds.

Summaries of Ten Learning Areas

Mathematics: Age 13

Almost all 13-year-olds understand whole numbers. Ninety-five percent were able to order whole numbers and answer questions about the additive and multiplicative properties of zero. More than half were able to identify a prime number.

Most 13-year-olds had difficulties with fractions. Fewer than 65% recognized 9 2/5 as a reduced form of 47/5 and fewer than 20% translated the decimal .333... to the fraction 1/3. Only about half indentified which fraction was between the values of two given fractions. Many 13-year-olds were able to order sets of two-digit decimals but very few (3%) were able to order a set of five fractions from smallest to largest.

Most 13-year-olds have learned the basics of computation. They can add, subtract, multiply and divide with single whole numbers. Operations with fractions again proved more difficult. Fewer than half could add two-unit fractions (with 1's in the numerators); however, about 60% could multiply two-unit fractions correctly. About 65% of the 13-year-olds could add two negative numbers, but fewer than 40% could multiply two negative numbers.

Applying their computational skills to simple word problems can be quite difficult for 13-year-olds. For example, only 33% determined how long it would take to travel 275 miles at an average speed of 50 miles per hour. An

additional 17% set up the equation properly but did not arrive at the correct numerical solution.

Most 13-year-olds could make comparisons between common units such as feet and yards, pints and quarts, nickels and dimes, and weeks and months, but comparisons using pounds and ounces seemed to be slightly more difficult. Actual conversions of one unit to another were much harder and were successfully completed by fewer than half of the students.

Thirteen-year-olds understand basic measurement but have difficulty with finely calibrated instruments. Almost all were successful in reading 10° graduations on a thermometer, but only about half could read the two-degree graduations. Similar performances were encountered in the use of rulers. Nearly all (93%) could read whole inches, 54% could read quarter inches and 25% could read eighth inches. Only about one-third of the 13-year-olds were able to use a protractor to measure each of three different angles.

Thirteen-year-olds can work only the simplest algebraic problems. Most (85%) could solve $x - 3 = 7$ for x, but less than half were able to give the value of $x^2 - 1$ when told that $x = 3$. Almost no 13-year-old could find the centigrade temperature corresponding to 77° Fahrenheit when given the conversion formula $F = 9/5\ C + 32^{\circ}$. Only about 20% could set up an algebraic equation, and about 13% recognized the graph of $y = x$.

Many 13-year-olds are unfamiliar with basic concepts of statistics and probability. Fewer than 40% could calculate a simple average. Only 13% were able to identify the median of a series of numbers. About half of the students knew that when the needle of a spinner is spun it is most likely to stop on the color covering the greatest part of the spinner surface. Only 15% knew

that the probability of heads on the next toss of a penny is .50 when the preceding three tosses have been two heads and one tail. About 10% knew the probability of drawing a red button is 1/6, when randomly drawing a button from an assortment of one red and five black buttons.

Thirteen-year-olds do not have very sophisticated shopping skills. When they were asked to find the package of rice with the lowest cost per ounce, only one-fourth of the 13-year-olds were successful. Almost half of them chose the largest package of rice without considering cost. About one-half of the 13-year-olds were successful at using a sales tax table. When asked to act as cashiers in a store, almost three-fourths were able to make change for a simulated purchase.

In summary, 13-year-olds are able to understand and compute with whole numbers. They have difficulty with fractions and word problems. They can make comparisons using common units and can measure as long as they do not have to use fine calibrations. Thirteen-year-olds have some difficulty solving algebraic expressions and only a few are familiar with the concepts of probability and statistics. Finally, most can make change when buying or selling, but few know how to determine the most economical packages to buy when shopping.

Science: Age 13

Most 13-year-olds know some basic facts about the solar system and the universe. For example, most knew that the earth moves around the sun once each year. About half could use a simple apparatus to demonstrate both the yearly earth cycle and the daily earth cycle. Almost all (90%) knew that

there are more stars in the universe than have been counted and most also knew that the sun is the only star we can see in the daytime.

Fewer 13-year-olds know specific facts about the earth. Only about 60% knew that a compass works because the earth has a magnetic field. The same number knew that man is the animal that has inhabited the earth for the shortest period of time. Only about one-fourth of the 13-year-olds selected the best explanation for finding a fossil of an ocean fish on a mountaintop.

Most 13-year-olds have some understanding of the functions of the major parts of the body, but few understand other aspects of human biology. Most knew the function of the lungs and that nerves carry images from the eyes to the brain. However, only about 40% chose "aids in controlling body temperature" as the main way that sweating helps the body. Only about one-third of the 13-year-olds knew that the human body has about the same density as water.

Results were varied in the area of health. About one-half of the 13-year-olds selected lean meat as a food that would provide protein for rebuilding body tissues. Most (77%) knew malaria is transmitted by an insect. More than half knew that cancer is uncontrolled cell division. Less than one-third knew what do to when a person faints.

Thirteen-year-olds' performance in biology demonstrated more knowledge of specific facts than understanding of processes. About two-thirds knew that the process whereby plants make sugar is called photosynthesis and that seeds come from the flower part of plants. However, only about half of the 13-year-olds selected "produce food and give off oxygen" as the reason green plants are important to animals. Even fewer were aware that man would eventually starve if all green plants died.

Thirteen-year-olds' knowledge about the atom is fairly limited. Only about 20% of the 13-year-olds knew that an ion is formed when a neutral atom loses an electron. A few more students knew that every atom has a nucleus. Less than one-half realized that a single atom cannot be seen through an ordinary light microscope or telescope. About two-thirds knew that all kinds of matter are formed from atoms.

Thirteen-year-olds know facts about heating and combustion, but again do not appear to understand the processes well. Even though most 13-year-olds knew the reason why fanning can make a campfire burn better, almost none picked "water vapor" as the substance produced when a candle burns. About half knew that a stopper would pop out of a test tube in which water was being heated because some of the water had changed to steam. More than two-thirds of the 13-year-olds could identify the most plausible explanation for water puddles drying up more quickly in the summer than in the winter.

Most 13-year-olds knew that energy is needed to light rooms, heat hamburgers and move cars. However, only 68% knew that the amount of work required to stop a moving car depends on the car's weight and speed. Most 13-year-olds recognized that if three objects have the same volume, the one floating the lowest in a liquid is the heaviest. Very few knew that the temperature of a mixture of equal amounts of hot and cold water would be the <u>average</u> of the two temperatures, although about half did know that the temperature would be somewhere between the other two temperatures.

Although most 13-year-olds believe that technology is beneficial and that scientific explanations of the world are beneficial, less than 20% of them were interested in becoming scientists. Although only 20% expressed a

great interest in science topics, another 70% had interest in some topics. About three-fourths said they read stories or articles about science or scientists at least sometimes.

In summary, it appears that 13-year-olds understand some aspects of the solar system and universe. Some understand specific facts about the earth. Most 13-year-olds know some facts about human and plant biology, but are unfamiliar with human diseases and the basic importance of green plants. Many are familiar with energy uses but not with facts about transfer of energy. Very few 13-year-olds know much about atoms. Finally, they seem to believe in the value of science and technology, but few want to become scientists.

Career and Occupational Development: Age 13

Most 13-year-olds know the primary duties of a number of occupations, and they are familiar with the skills needed to perform particular jobs. Most were able to match a variety of job titles with job descriptions. For example, about three-fourths knew that a social worker spends time helping people with their personal problems and almost all (96%) recognized a description of a newscaster's job. Most 13-year-olds had visited a variety of job sites such as factories, farms and airports. Most knew which hobbies would be helpful to persons planning each of a number of different careers. Finally, 13-year-olds could compare the relative salary levels of a number of common jobs and professions.

About 60% of the 13-year-olds were able to think of at least five things that should be considered before choosing a job or career. Working conditions

and job benefits were the considerations most frequently mentioned; personal satisfaction or goals also were mentioned often. Half knew several sources of information about a job that interested them.

One important goal of career education is to help young people recognize personal strengths and weaknesses. Many 13-year-olds were able to identify a current hobby or interest that might be useful for a job, and almost all could identify one thing that they do well and one thing that they do not do well. More than 80% were able to identify two things that they could and could not do well.

Most 13-year-olds seem to be willing to work with those in authority positions. Most said they would ask the person who assigned a task for help if they did not understand the task. Three-fourths said they had sought advice about how to improve their performance in some type of activity. Also, more than half indicated that they would discuss an unfair school rule with a person in authority.

By age 13 young Americans have had a considerable number of work and work-related experiences. Most 13-year-olds (82%) have worked part time for pay and many have worked without pay away from home. The most frequent paid jobs were cleaning, babysitting and working as a waiter or waitress. Many 13-year-olds had also cut lawns, washed cars, washed windows and collected trash. Furthermore, many 13-year-olds have had some kind of training outside of ordinary schooling. Sixty-two percent have taken two or more kinds of lessons, with the most popular being music, art and individual sports lessons.

In summary, 13-year-olds appear to be familiar with the duties, skills and salaries connected with a variety of occupations. In addition to knowing

things to consider when choosing a career, over half know how to find out more about particular jobs. Perhaps most important, many 13-year-olds have already held paying jobs outside of home and have had some type of organized learning experiences outside of regular school.

Citizenship/Social Studies: Age 13

Many 13-year-olds understand and support constitutional rights. Thirteen-year-olds felt that everyone's vote should count equally regardless of sex, education or affluence. They realized that neither the President nor Congress can limit the media, and they knew the rights of the accused. Most understood that everyone, including the President and army generals, must obey the law, although 12% thought that the President need not obey the law. Over 90% agreed that religion should not be a determining factor in getting a job, but only two-thirds felt atheists should be allowed to air their views publicly and only half supported religious freedom for elected officials. Two-thirds knew that Congress cannot establish a national church. About three-fourths supported freedom of speech and press when the topics were political rather than religious, and approximately two-thirds supported the right of assembly.

When asked why society has rules and regulations, two-thirds stated a plausible reason. The most common reasons involved the protection of life and property. Most favored laws against vandalism and supported the idea that others should do something to prevent vandalism. Three-fourths said they would do something about an act of vandalism themselves.

In addition to supporting rights and freedoms guaranteed by the law, 13-year-olds believe in equality in social situations. For example, they are

generally tolerant and understanding of those with different skin colors. Almost all were willing to have a friend with a different skin color. They also believed in open housing and felt that skin color should not be a determining factor in getting a job. However, 17% expressed unwillingness to sit next to a person of a different skin color in class. Thirteen-year-olds lack specific knowledge of minority-group contributions to society. A few could name famous Indians and about one-third could name famous black Americans, but virtually all were unfamiliar with the contributions that Oriental and Spanish-speaking Americans have made to the culture of the United States.

Thirteen-year-olds also have positive attitudes and poor knowledge about other social issues. Nearly all expressed concern for the physical and psychological welfare of people who had to live in poor housing conditions. However, only about one-third could suggest ways to fight poverty and less than one-fifth could state reasons why poverty exists. Although most could name problems facing large cities (the most frequently named were pollution, crime and overpopulation), only two-thirds could formulate acceptable questions to ask about the problems they named or could list sources of information related to those problems.

Thirteen-year-olds may not be particularly assertive. When given a hypothetical opportunity to gain information from public figures such as a mayor, labor leader or television newscaster, the students tended to ask vague, general questions -- "Do you like your work? Is it fun?" Approximately 90% felt an unfair law should be changed, and just as many knew it could be changed. However, only about half could name two things to do about a law

they considered unjust, and slightly fewer said that they had helped to change a school rule. Sixty-nine percent of 13-year-olds said they helped make decisions in school at least sometimes. About two-thirds said that they had worked to bring about changes in their school. Most 13-year-olds felt they were encouraged to speak openly and freely, to make up their own minds and to express their opinions in class, yet only three-fourths felt free to disagree openly with their teachers. About 80% felt they shouldn't give in to peer pressure.

Thirteen-year-olds generally are not interested or informed about politics and voting. About two-thirds of the 13-year-olds said they had taken a course in the last three years that had dealt with government and politics, and about half said they discussed local, national or international politics in class every week or so, but less than half had participated in political processes beyond a superficial level. Just over half thought it was always important to vote. About half could choose between two candidates and defend their decision, and a similar number could suggest ways to evaluate political candidates. Only about half expressed an interest in learning about government, and very few said they liked to watch television programs about elections and politics. Less than half knew it is not against the law to have more than two political parties, and only one-third knew that the U.S. Constitution says nothing about the role of political parties. Two-thirds did feel the United States would not be better with only one political party.

Thirteen-year-olds' have varying knowledge of the structure and function of the U.S. government. Although they understood that the federal, state and local governments have different functions, they were unclear about what those

functions are. Fifty-one percent of the 13-year-olds knew that local governments do not make laws about military services, and 69% knew that local governments operate public schools. Less than half correctly answered all of a series of questions about the functions of local government.

Some of the lowest percentages were registered on questions about the composition and responsibilities of the legislative branch of the federal government. Only about one-third knew that a state has two senators and that the number of representatives varies according to the population of a state. Three-fourths did know that senators are elected rather than appointed. Less than half knew that Congress passes laws about taxes, and only a few could explain that Congress can prevent the President from sending U.S. troops abroad by cutting off funding.

The results on questions about the judicial branch were quite varied. Most knew that the function of a trial is to determine guilt or innocence. About two-thirds were familiar with the general jurisdiction of courts in the United States; for example, 70% knew a court could decide whether a person has been unfairly denied a job. Only about one-third understood the functions of the U.S. Supreme Court. Only about one-fourth knew that people can refuse to give testimony that might incriminate them.

Thirteen-year-olds understand some things about the office of the chief executive. Most 13-year-olds knew that the President suggests laws to Congress and that he has a veto power. However, less than half knew that he does not appoint people to Congress or that he does appoint cabinet members. Also, one-third thought that the house of representatives nominates the President, and less than one-fifth knew that presidential candidates are nominated by national conventions.

Most 13-year-olds have the study skills needed to gain knowledge about social and political issues. Most were familiar with basic reference materials such as newspapers, television and encyclopedias; only about one-third could identify a use for the Readers Guide to Periodical Literature. Three-fourths could select an appropriate card catalog card to use when researching a certain topic. The students used an index with varying degrees of success. About half the 13-year-olds could read information from various types of graphs. They had the greatest difficulty in reading and interpreting maps.

Some 13-year-olds can also interpret information. Eighty-three percent could describe the social implication of a political cartoon, and three-fourths could describe the implications of pictures and poems -- however, all but one-third took the words of songs literally. About three-fourths could recognize generalizations that go beyond the information given, distinguish fact from opinion and identify statements that could be proved and could not be proved. Only about half could identify unstated assumptions.

In summary 13-year-olds have developed generally tolerant and sympathetic social attitudes. They also have a good understanding of the rights guaranteed in the constitution. Yet they have a variable knowledge base in the social sciences. Although they do know a number of facts about the structure and function of government, they appear to be confused about the relationships among the three branches of government, and they are particularly uninformed about the structure and functions of the legislative branch. Very few have developed a practical interest in politics, and only about half have begun to prepare to become responsible, active citizens.

Reading: Age 13

Many 13-year-olds can comprehend the literal meaning of short, straightforward materials. About 90% of the students correctly answered questions that required them to use a table translating American clothing and shoe sizes into European sizes. Nearly as many students recognized which one of four simple sentences conveyed the same meaning as an original sentence that used the same words. Also, most were able to follow directions and sequences of events in written material. For example, they were able to draw a geometric figure by following a set of written directions about placing and connecting dots on a page. In another situation, they read a three-paragraph description of the way to perform a magic trick. Almost 90% recognized the first step of the trick, and 75% understood what the magician was supposed to do at a later point in time.

Three questions about information contained in telephone bills and directories were answered with varying degrees of success. About 80% of the students could read a phone bill to determine the origin of the call and how much it cost; about 75% could use phone book information to determine the number to call for long-distance information; however, only about half of the 13-year-olds correctly answered a question about the time of day that certain long-distance charging rates are in effect.

There are more complex practical materials that only about half of the 13-year-olds can read at a literal level. For example, about 50% of the students could read the fine print on a parking ticket to determine the fine for parking overtime. About half understood fishing regulations restricting the type of fish that could be caught, and the same proportion realized that

a certain number of additional books had to be purchased if one became a member of a book club. The book club advertisement also explained that no money was to be sent with the order coupon -- the member would be billed later for the cost of the books plus a shipping charge. Only 36% of the 13-year-olds understood this information.

Thirteen-year-olds make inferences about reading materials with varying degrees of success. Almost 90% could determine the object referred to in a three-sentence description in which a nonsense word replaced the name of the object. Two other inferential tasks required the students to ascertain the main idea of a short passage. About 75% realized that one passage was an exaggerated description of a common bug, and the same proportion selected the most appropriate title for a story about Central Park in New York.

Other inferential reading tasks are more difficult for 13-year-olds. Two-thirds of them understand the social implications of a newspaper cartoon about school dropouts being unemployed, and the same number understood the meaning of a public service advertisement about hiring the handicapped. Only about half of the 13-year-olds could determine which sentence in a group of four sentences was not about the same topic as the other three. After reading a three-paragraph passage about explorers at the South Pole, only about half of the students selected the most appropriate title for the passage.

Thirteen-year-olds had great difficulty reading two long, complex passages, one about the behavioral and social sciences and one about the arts. Only about 25% of the students could answer inferential questions about these passages. Another difficult task involved a phrase that, in the context of a poem, meant something different from its common literal meaning. Only 13% of the 13-year-olds knew the appropriate meaning of the phrase.

Thirteen-year-olds' knowledge of reference sources and their skills in using these sources are superficial. For example, 94% of the students knew that a dictionary is used to find meanings of words, but only 78% of them could use three-letter alphabetization skills to determine from the guide words the dictionary page on which a certain word would be located. About three-fourths of the students correctly used a map legend from a history book to determine which country controlled a certain land area. About 65% could use a list of topics with page numbers from a book index to determine which topic would come first in the book. Only 20% of the 13-year-olds could identify the call number of a book on a card from a library card catalog.

In summary, over 80% of the 13-year-olds have sufficient reading skills to follow brief written instructions, understand simple sequences of events, make translations of numerical information in a table and understand the meaning of a simple sentence. Many 13-year-olds can also understand the main ideas of short, story-like passages.

About three-fourths of the students are able to understand information in a telephone bill, use three-letter alphabetization skills and infer the meaning of a newspaper cartoon. However, fewer students can understand conditions associated with membership in a book club, and only about half of them can determine the fine to be paid for a parking ticket. Most students cannot understand reading passages with sophisticated language and meaning.

Literature: Age 13

Thirteen-year-olds read frequently for their own enjoyment. About three-fourths said they read for pleasure at least once a week. Most named works

of fiction when asked to give the titles of literary works they had read. The largest percentage of titles mentioned were young people's books such as Hardy Boys and Nancy Drew mysteries, sports stories for teenagers, horse and dog novels, nurse books and romances. Although 22% gave titles categorized as young people's classics or young adult classics, 15% reported titles that fell into the children's books category. Some 13-year-olds reported they had read short stories and biographies, and over a third were able to give verifiable titles. Few 13-year-olds had read plays or poems. On another survey question in which they were asked to describe the selection in addition to giving the title, over half were able to provide descriptions of biographies as well as descriptions of novels. Very few had read books of short stories.

On a variety of recognition and description tasks, 13-year-olds indicated familiarity with a restricted range of literary works and characters. For example, almost all recognized Red Riding Hood; about three-fourths recognized Alice in Wonderland; just over half recognized Winnie-the-Pooh and Sherlock Holmes. Less than half recognized a parody of "The Charge of the Light Brigade," and Job and Don Quixote were essentially unknown characters to most 13-year-olds.

Many 13-year-olds have some familiarity with the elements of literary language. Approximately three-fourths could choose the most appropriate line to complete a poem, and the same percentage could answer questions about metaphors. Most could answer a question about the mood of a passage, although they had difficulty explaining their answer. They had the greatest difficulty recognizing puns.

About half of the 13-year-olds understand the value of literature but few can discuss a work meaningfully. Although three-fourths of the 13-year-olds

felt literature should be studied in school, only half could explain why they felt that the study of literature is valuable. Even fewer could explain either orally or in writing how a particular story or poem might be meaningful, enlightening or useful. When the 13-year-olds talked to an interviewer about two poems, their most frequent statements were simple evaluations ("It is good.") or expressions of feeling ("It made me angry."). Less than 20% of the 13-year-olds gave responses that indicated any in-depth understanding of either poem. When asked to write about stories or poems, 13-year-olds were somewhat more successful. One-fourth were able to write thoughtful responses about the story "Half a Gift." About 20% wrote responses that indicated they understood the meaning of the poem "Space Travelers." Written responses to the poem included the most attempts (30%) to interpret the meaning of a work. Many of the 13-year-olds merely paraphrased on both tasks.

In conclusion, 13-year-olds say they read frequently for their own enjoyment. They usually read fiction and do not appear to be familiar with a wide range of literary works or characters. They feel literature is important and most understand some elements of literary language. However, when asked to discuss a story or poem, either orally or in writing, less than one-fourth of the 13-year-olds are able to provide meaningful interpretations or thoughtful evaluations of the selections.

Writing: Age 13

Many 13-year-olds understand how to write straightforward business letters. For example, about three-fourths were able to write a letter to a pencil company explaining that the wrong name had been printed on their

order of personalized pencils and suggesting a solution to the problem. Most of the students could address an envelope, although only about half consistently included dates, greetings, closings and signatures in their letters. Most could select the most informative and appropriate invitation to send to a prospective school speaker.

Some 13-year-olds can write persuasive letters. They wrote one letter to the parents' club of their school explaining how long a school dance should last. To accomplish this task successfully, students had to state how long they wanted the dance to be and give reasons supporting their position. Less than two-thirds of the 13-year-olds wrote successful letters. Students also wrote to their principal asking that one change they felt was important be made in the school. One-third of the 13-year-olds argued for their change in a logical and persuasive manner. Forty percent of the responses were sketchy or disjointed. One-fourth of the respondents merely gave random lists of various changes they would like made.

One essay-writing task was designed to determine what organizational methods students would adopt in an unstructured situation. The directions were to listen to Scott Joplin's "New Rag" and write about "whatever the music brought to mind." About two-thirds of the 13-year-olds responded with lists of unelaborated ideas, making no effort to link statement to statement. A few linked bits of information and one-fourth organized information around topics.

Another writing task asked 13-year-olds to become part of an imaginary situation depicted in a picture. One-third of the papers were organized with strong lead sentences and clear transitions and were elaborated through imaginative and controlled use of detail. A majority of the responses lacked

the control and consistency necessary to create a structured presentation. These papers lacked imagination. Few contained internal transitions and the details used often detracted from the presentation. Ten percent of the students either simply described the picture or listed random bits of information.

In a highly-directive task designed to assess sentence- and idea-ordering abilities, respondents were given five facts about the moon and asked to write a report for their science class. The students were told to "report the facts in an order that would be clear and would make sense." One-fourth of the papers were elaborated extensively and coherently, but only a few of them were totally unified. However, even with explicit directions and time to revise their reports, the majority of the responses were disorganized or under-developed. Over half of the 13-year-olds wrote a series of unrelated clusters of thoughts, and another one-fourth only listed the facts. Although 78% of the students revised their reports, less than a fourth of those who revised made any type of organizational change, and the quality of the reports remained about the same. Two-thirds did make specific mechanical and informational changes, while less than half made grammatical changes. Of those who did make substantial changes, there were almost as many declines as improvements.

Thirteen-year-olds were somewhat more successful in writing descriptions. In three-fourths of the papers describing "something worth talking about," sentences and ideas were logically ordered and coherently related to one another.

A detailed analysis of the descriptive essay revealed 13-year-olds know the mechanics of writing. However, their essays tend to be short and one-third of the sentences were awkwardly constructed. About half the sentences

written were simple sentences and when 13-year-olds combined simple sentences, they used coordination as often as complex sentence structures. There were two compound sentences and a run-on for every three complex sentences. The average essay contained one agreement error, two comma errors, one apostrophe error and one word-choice error.

In summary, many 13-year-olds can write short, uncomplicated messages. Most can write rudimentary social and business letters. Although few 13-year-olds can be considered excellent writers, about one-fourth to one-third of them can communicate ideas, feelings and arguments in writing. Most 13-year-olds are aware of the basic mechanics of writing, and they can write short, elaborated passages about one fact or idea. They have difficulty organizing these clusters of ideas into a logical and coherent presentation.

Music: Age 13

In music performances, 13-year-olds are better able to repeat or improvise rhythmic patterns than pitch patterns. Over 90% of the students maintained correct rhythm while singing "America" with a chorus of voices. The percentage able to maintain correct rhythm dropped to 85% when the chorus stopped and the students completed the song on their own. Most students (80%) could tap out an improvised rhythm to accompany a piece of instrumental music, but only 55% could successfully repeat a four-bar rhythmic pattern they had just heard.

The ability of 13-year-olds to sing correct pitches depends on whether they are singing by themselves or accompanied by a group, whether they are familiar with the tune and whether they are singing melody or harmony. When singing "America" with accompaniment, 55% could maintain pitch; when singing

by themselves, 48% maintained correct pitch. Half of them could improvise an appropriate melody as an ending phrase for an unfamiliar line of music, but when asked to repeat a four-bar melodic pattern, only 3% could do so. Less than 10% of the students could repeat or improvise a harmonic melody line. Very few 13-year-olds sight read unfamiliar musical notation. Only about 10% could sight-sing a six-bar line of music.

Thirty-five percent of the 13-year-olds said they played a musical instrument. The majority of them played the piano. When asked to play selections of their own choice, about three-fourths of all of the instrumentalists gave adequate or good performances.

Two-thirds of the 13-year-olds believe that playing an instrument in small or large groups is enjoyable, but only 17% belong to an instrumental group. Similarly, many students enjoy singing in either small or large groups, even though only one-fourth of them belong to organized singing groups.

Thirteen-year-olds are acquainted with a variety of musical instruments. Most knew whether specific instruments are played by blowing, by striking or by plucking. All could recognize the sound of a piano or a trumpet; most were familiar with the sounds of common brass and woodwind instruments, but few recognized the oboe and cello. Only half of the students could circle all of the brass instruments pictured in an orchestra seating plan, but in another exercise, 80% of them correctly circled all of the trumpets.

Slightly over half of the 13-year-olds could name notes shown on a musical staff and recognize sharp and flat symbols. Only 22% knew that two eighth notes equal one quarter note. When asked to listen to a recording and follow the notation of the music, about half were able to match the pattern of the

notes to the recording and mark where the music stopped. Only 22% detected a discrepancy in pitch between a recording and its musical notation.

Nearly half of the students were able to detect whether two pieces of music differed in rhythmic, melodic or harmonic structure. Slightly over half could recognize style similarities between two selections composed by the same person.

About 80% of the 13-year-olds knew the names of the tunes "This Land Is Your Land" and "When the Saints Go Marching In." Only half knew the name of "America the Beautiful" and one-fourth could name "Beethoven's Symphony No. 5" or the "March" from the Nutcracker Suite. About the same number knew that Tschaikovsky composed the Nutcracker Suite and that Sousa wrote the "Stars and Stripes Forever."

About 85% of the 13-year-olds listen to music on the radio several times a week; 60% listen to tapes or records. When asked about their favorite kind of music the majority said rock music. Less than 5% liked to listen to each of the following: classical, jazz, folk or country-western.

In summary, most 13-year-olds are familiar with the names and sounds of musical instrumerts, even though only one-third of them play instruments. Most of the instrumentalists are able to give adequate solo performances. Most students can sing familiar songs with accurate rhythm, but only about half can sing on pitch. In general, results from a variety of tasks indicate that about 20% have a thorough understanding of the elements of musical notation. Although half of them know notes' names and sharp and flat symbols, only about 10% can sight-sing from notation.

Few students know very much about music history and literature; they are familier with the names of some common composers and their works, but quite

unfamiliar with most classical pieces of music. The 13-year-olds have strong positive attitudes about singing and listening to music. However, not very many of them are actively involved in vocal or instrumental performing groups.

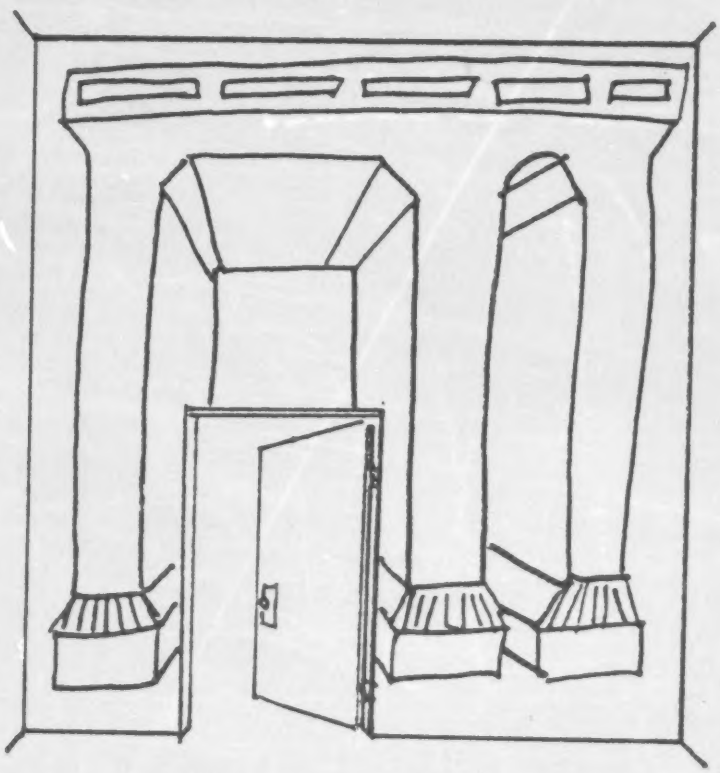
Art: Age 13

At the present time results are available for three drawing-skill tasks from the art assessment.* One task involved creating a design, one measured perspective drawing skill and the other involved drawing a running person.

Less than half of the 13-year-olds (42%) were able to combine various perspective techniques to draw a picture of four people seated at a table. In scoring the drawings, credit was given for drawing converging lines in the table, overlapping objects, making near objects larger than far objects and placing objects lower or higher on the picture plane. A drawing with 7 out of 14 possible perspective techniques received an acceptable overall score. Generally, 13-year-olds did not use enough techniques to produce a successful perspective drawing, but separate consideration of each technique showed mixed results. Although 40% drew only a profile or a bird's-eye view of the table top, 44% used converging lines in drawing acceptable table tops. Also, most students drew some overlapping objects. Sixty percent drew the table overlapping a figure; 40% drew a figure overlapping the table; and 13% drew a figure overlapping another figure. Over half placed objects higher and lower on the picture plane. However, only about 20% drew the back legs of the table or chairs shorter than the front legs.

*National Assessment reports about knowledge of art history and about attitudes toward art will be available later this year.

The 13-year-olds performed best on the task of creating a design for a blank bedroom wall with an off-center door. Fifty-five percent of the students drew designs that fit the shape of the wall. An example of a successful design is shown below. About 40% of the drawings contained integrated elements, but only 20% incorporated the door into the overall design. Seventeen percent of the designs contained unusual or surprising elements such as objects drawn in an unusual scale or objects not normally found on a bedroom wall.



Another task required the 13-year-olds to draw a person who is running very fast. For a drawing to portray motion successfully, the human figure had to be leaning in the appropriate direction with arms and legs bent and pointed

appropriately. Expressive devices such as flying hair, a falling hat, both feet clearly off the ground and movement lines were also scored as helping to depict motion. In 78% of the drawings, at least one arm was bent appropriately and, in 44%, at least one leg was bent appropriately. However, only 25% of the drawings had the body leaning toward the direction of the motion. Fifty-five percent included special expressive devices.

In summary, many 13-year-olds can create a design that artistically fits a space, although 45% of them are unable to create a well-integrated design. Their perspective drawing skills are somewhat varied. Sixty percent of the students can use the technique of overlapping objects, almost half can use converging lines to show perspective in a table top and about the same proportion can portray distance by drawing figures higher and lower on a picture plane. Less than half can combine techniques to do a perspective drawing. Only about 40% of the 13-year-olds can successfully manipulate the elements of human form to depict motion.

Highlights of What 13-Year-Olds Know and Can Do

The following statements summarize the findings about what many 13-year-olds (more than two-thirds) know and can do.

- Many can add, subtract, multiply and divide whole numbers.
- Many can make comparisons using common units of measurement.
- Many can make change.
- Many understand basic facts about the solar system and universe.
- Many know the functions of the major parts of the body.
- Many are familiar with the uses of energy.
- Many value science and technology.
- Many are familiar with the duties, skills and salaries related to a variety of occupations.
- Many know things to consider when choosing a job or career.
- Many can identify some things they do well and other things they do not do well.
- Many have had paying jobs.
- Many have gained work-related experience by working without pay away from home and by taking lessons outside of school.
- Many have developed tolerant and sympathetic social attitudes. They are concerned about the welfare of others and tolerant of those who are different.
- Many know that pollution, poverty and crime are social problems.
- Many understand and support the rights guaranteed in the U.S. Constitution.
- Many undertsand the basic functions of the court system.

- Many believe in the law and authority.
- Many know that unfair laws can be changed and believe they should be changed.
- Many have a general sense of history.
- Many know how to use basic reference materials.
- Many can read and comprehend short, straightforward materials.
- Many can follow written directions or sequences of events.
- Many have the three-letter alphabetization skills necessary to use dictionary guide words.
- Many frequently read fiction for their own enjoyment.
- Many can read for main ideas and understand some elements of literary language.
- Many value literature.
- Many can write rudimentary social and business letters.
- Many can write a cluster of two or three related ideas.
- Many are familiar with letter-writing conventions and can address envelopes.
- Many are familiar with the names and sounds of most musical instruments.
- Many can improvise rhythms and follow rhythmic patterns while singing.
- Many believe that singing is enjoyable.
- Many frequently listen to rock music for their own enjoyment.
- Many can draw a running person's arms in appropriate positions.

The following statements summarize the findings about what some 13-year-olds (approximately 33% to 67%) know and can do.

- Some understand and can compute with fractions.
- Some can work story or word problems.

- Some can manipulate algebraic expressions.
- Some can use measuring instruments with small calibrations.
- Some understand basic nutrition.
- Some understand specific facts about the earth.
- Some know why green plants are important.
- Some know ways to find out about careers.
- Some understand there are different levels and functions of government.
- Some understand the office of the Chief Executive.
- Some show the tendency to assert themselves politically.
- Some can read and understand detailed instructions.
- Some can recognize a limited range of literary works and characters.
- Some can argue persuasively in writing.
- Some know musical symbols and terms.
- Some can sing familiar songs on pitch.
- Some can improvise a melody.
- Some can draw an artistic design.
- Some can show perspective by drawing converging lines, overlapping objects or objects placed higher or lower in the picture plane.
- Some can draw a running person's legs in appropriate positions.

The following list summarizes the findings about what few 13-year-olds (less than one-third) know and can do.

- Few understand probability or statistics.
- Few can choose the most economical buy at a supermarket.
- Few know very much about the atom.

- Few know what to do when a person faints.
- Few understand the transfer of energy.
- Few want to become scientists.
- Few understand the basic principles of economics.
- Few understand the structure and function of the legislative branch of government.
- Few understand the relationships between branches of the U.S. government.
- Few are able to suggest solutions to social problems.
- Few can infer meaning from sophisticated passages of prose.
- Few can thoughtfully evaluate poetry and prose.
- Few can organize and elaborate ideas in writing.
- Few can express feelings in writing.
- Few understand musical notation.
- Few are familiar with classical composers.
- Few draw a body leaning forward to show motion.
- Few can show perspective by drawing objects larger and smaller to show distance.

Patterns of Group Results: Age 13

Regions

Southeast. The Southeast was generally the poorest-performing region and almost always performed below the nation. The best performances by this region were in music, literature and citizenship. Students expressed strong attitudes toward music, said that they read literature often and indicated strong political attitudes.

West. The Western region generally performed somewhat below the nation, although the students did perform slightly above the nation in literature and writing.

Central. The Central region generally performed slightly above the nation. Students performed better than all other regions, although only slightly better than the Northeast, in writing, reading, art and music. Their best performance relative to the nation was in the art assessment.

Northeast. The Northeast always performed better than the nation and was the best-performing region in science, mathematics, literature and citizenship/social studies.

Females and Males

Females. Females consistently outperformed males in literature, reading, music and writing. In the career and occupational development assessment, females performed better than males on exercises requiring writing skills. In art, they were better than males at creating a design.

Although males had the overall advantage in mathematics, females outperformed them on items measuring knowledge of variables and relationships, and numbers and numeration. In citizenship/social studies, females did better than males on social attitude items.

Males. Males outperformed females in every area of science and had an overall advantage in citizenship/social studies. In citizenship/social studies, males outperformed females in knowledge areas. In fact, males performed better than or almost as well as females on the knowledge questions in all learning areas. For example, despite an overall female advantage in literature and music, males and females performed almost the same in recognizing literary works and equally well in music knowledge.

In mathematics, males performed better than females in the areas of measurement, probability and statistics and geometry. They also performed better than females on computation and measurement and manual-perceptual skill items in career and occupational development. In the art assessment, males were better than females at drawing a running person.

Blacks and Whites

Black performance was consistently far below white performance. The smallest difference in performance was in the area of music. However, blacks and whites did not differ in the area of political attitudes.

Size and Type of Community

Students from low-socioeconomic metropolitan (low metro) areas consistently performed below other types of communities; their high-socioeconomic metropolitan (high metro) counterparts just as consistently outperformed other types of communities. The biggest differences in the performances of the low metro and high metro students occurred in mathematics, science, reading and art. The smallest difference was found in music.

Level of Parental Education

The performance of 13-year-olds was directly related to how much education their parents had. Those whose parents had no high school education were consistently the lowest-performing group. Those whose parents had some high school education generally performed somewhat below the nation. When at least one parent had graduated from high school, the students performed somewhat above the nation, and when at least one parent had some post-high school education, the students performed the best.

Change in Educational Achievement: Age 13

National Assessment has measured changes in achievement levels in three learning areas: science , reading and writing. At age 13 the nation declined in science knowledge, inferential reading and the ability to write essays. On literal reading tasks and short writing tasks there was a trend toward improvement for the nation as a whole. In other words, there may be more 13-year-olds now than there used to be who are able to accomplish the easier reading and writing tasks, but fewer who can accomplish the more difficult tasks. Data also suggest that the gap in achievement between the Southeastern region and the nation is becoming smaller.

Science Change

The average percentage of 13-year-olds able to answer a typical science question decreased by about two percentage points from 1969 to 1973. The performance of those living in the Southeast did not go down; however, their performance was still below all other regions.

Male and female performance declined by about equal amounts. Unfortunately, the performance of blacks declined more than the performance of whites from 1969 to 1973, so the black deficit grew even larger.

While other community types declined, the extreme rural performance went up by four percentage points, but the rural students' performance was still slightly below the national average.

Reading Change

Between 1971 and 1975 there were mixed indications of changes occurring in the reading skills of 13-year-olds. On literal comprehension tasks, there was a trend toward improvement for most groups and for the nation. For example, significant increases in performance were found for students living in the Southeastern region of the country and for students living in small towns. There was a tendency toward a national decline in performance on inferential reading tasks; there was a significant national decline of almost two percentage points on the study skills tasks. All groups showed a tendency toward a decline in inferential reading and study skills: females, for example, dropped an average of 2.4 percentage points on the study skill tasks.

Writing Change

A variety of writing tasks were given to 13-year-olds first in 1969 and again in 1973. Although there was a national decline in the overall quality of essay writing, other types of writing tasks showed either no change or an improvement in 1973.

Responses to a descriptive writing task were scored for sentence and paragraph structure and mechanical correctness and were given an overall rating based on the quality of the whole essay, disregarding specific aspects of style, content or mechanics. In 1973, the average essay was of lower overall quality than in 1969. The decline was in the better half of the papers; in particular, the proportion of excellent papers dropped from 19% to 13%. The proportion of poor papers increased. So at age 13 the papers were more

homogeneous in 1973 than they were in 1969. Unfortunately, this is not a result of the poor writers catching up to the good writers, but instead is a result of a decreasing number of good writers.

There were other changes in the quality of essays. On the average the 1973 essays were 17 words, or one sentence, shorter; the vocabulary, as measured by the average number of letters per word, was simpler, the essays contained 7% fewer complex sentences, 5% more run-on sentences and 2% more fragments and contained fewer sentences with phrases and 10% more awkward sentences.

In 1969, three out of every four paragraphs in the average paper were coherent. The proportion did not change in 1973, although the papers averaged fewer paragraphs than in 1969.

Spelling skills did not change during this period; however, there was a slight increase in misspelling of plurals and an increase in the percentage of misspellings that reflected an attempt to sound the word out. Apparently, phonetic approaches to spelling have had an impact on this age level.

In summary, although there were no changes in the number of most types of mechanical errors, the average 1973 paper was shorter, less sophisticated in expression and more awkwardly written than the average 1969 paper. These features probably account for the drop in the overall ratings.

Results on other types of writing tasks are more encouraging. On tasks where short, simple expression can be used effectively, such as in business letters, there was no decline in performance. There may even have been a slight improvement, since students included more specific information in their letters. There was an improvement in the percentage of students successfully

using letter writing conventions (date, greeting, closing, signature). Nationally, the improvement was six percentage points (from 49% to 55%); girls improved nine percentage points and white students improved eight percentage points. Low-metro students, on the other hand, declined eight percentage points in their ability to use letter writing conventions.

Nationally, there was also an improvement in the percentage of 13-year-olds able to transcribe a telephone message correctly. Nevertheless, only 34% succeeded on this task in 1974. When asked about ways of giving information to others, more 13-year-olds in 1974 gave an answer that included written forms of communication. However, fewer of them seemed to write letters.

Conclusion: Age 13

Many 13-year-olds have the skills and knowledge necessary to accomplish routine tasks at home and at school. They know how to read, write and do arithmetic. They have developed some study skills and know a variety of useful facts. However, the idea that they could use the skills and knowledge they have learned in school to make their daily lives more interesting and productive may not be obvious to them.

Thirteen-year-olds can read and understand short, straightforward materials and recognize the main idea from a relatively long reading passage, and they know how to use basic reference materials -- which means that, theoretically, 13-year-olds can look up information they don't know. They should be able to read for enjoyment -- and most say they do. However, it is doubtful that they appreciate the total usefulness of reading skills. Even though many say they think literature is valuable, only half can give reasons why the study of literature is important. Few can discuss a story or poem meaningfully, and few read any type of literature besides fiction with any frequency. In addition, only about half are able to read and understand detailed directions in order to determine long-distance telephone rates or the extent of their commitment when joining a book club.

Thirteen-year-olds have difficulties applying their skills in other areas. They can do basic addition, subtraction, multiplication and division. However, they do not understand how to use numbers in a problem-solving

situation such as buying items in a supermarket. They can write routine letters, but most do not think of writing as a useful tool that can be used to express and communicate ideas. They enjoy music and can sing melodies, but only a few belong to musical groups.

These teenagers have developed the social attitudes of tolerance and concern for others. They believe in equality and fair treatment for all. They recognize social problems and would like to do something about them. However, they cannot formulate solutions to problems. For example, they understood that poverty is caused by lack of money and that education helps people make money, yet few 13-year-olds could suggest a way to solve the problem of poverty. They know that to do something about injustice one should talk to a person in authority, but their understanding of government is so minimal that it is doubtful whether a 13-year-old would know who has authority in specific situations. Although some have been involved in decision-making activities in their school, 13-year-olds seem to be passive rather than active.

Compared to 13-year-olds at the turn of the century, the fact that today's 13-year-olds have such a variety and quantity of skills and knowledge could be considered quite encouraging. Also, it may not be necessary for them to be able to attend to adult-life problems. However, apparently 13-year-olds do not realize the potential usefulness of the skills and facts that they have learned, and in today's complicated society it is not too early for them to begin relating their skills and abilities to decision making and problem solving.

Some groups of 13-year-olds, such as those in the Northeast, those in high-socioeconomic metropolitan areas and those who are white, generally perform

above the national level. Those living in the Southeast, those living in low-socioeconomic metropolitan areas and those who are black perform below the national level in all learning areas.

The nation's 13-year-olds declined in science knowledge, inferential reading and the ability to write essays. On literal reading tasks and short writing tasks there was a trend toward improvement for the nation as a whole. In other words, there may be more 13-year-olds now than there used to be who are able to accomplish the easier reading and writing tasks, but fewer who can accomplish the more difficult tasks. In addition, the gap in achievement between the Southeastern region and the nation is becoming smaller.

CHAPTER THREE

PROFILE OF 17-YEAR-OLDS

This chapter presents an overview of the skills, knowledge and attitudes of 17-year-olds. In order to provide this information, the results from the national assessments of 10 learning areas have been studied and summarized in a variety of ways.

The chapter is divided into five major sections. The first and most lengthy part of the chapter is devoted to brief descriptions of performance in each learning area.

The second section, "Highlights of What 17-Year-Olds Know and Can Do," contains three lists of skills, knowledge and attitudes from all the learning areas. The lists highlight achievements attained by many 17-year-olds, some 17-year-olds and few 17-year-olds.

The third section describes the patterns of results obtained for males and females, blacks and whites, regions of the country, different types of communities and different levels of parental education. (These reporting groups are defined in the Introduction.) Next, changes in achievement over time are discussed. The chapter concludes with a brief statement about the overall strengths and weaknesses of 17-year-olds.

Mathematics: Age 17

Most 17-year-olds have mastered basic computation using whole numbers and decimal numbers. Almost all 17-year-olds were able to add 38 + 19, subtract 36 - 19 and divide 125 ÷ 5. Nearly as many could multiply 38 x 9. Ninety percent could correctly add decimals involving money. In general, fewer than 2% of the 17-year-olds had problems carrying in addition. Although 90% could do subtractions requiring borrowing once, only about 80% were successful on a problem requiring borrowing three times. About the same number were able to subtract using decimals. Ninety percent of the 17-year-olds could multiply a two-digit number by a one-digit number, and 80% could multiply two three-digit numbers. About 80% of the 17-year-olds could multiply decimals without errors in decimal placement. Fewer than 80% of the 17-year-olds could correctly divide a five-digit number by a one-digit number.

Seventeen-year-olds can perform some operations with fractions. Most 17-year-olds (81%) chose 9 2/5 as the correct reduction of 47/5, and nearly all could properly order decimal fractions. However, only about 40% of the 17-year-olds knew that .333... is 1/3 or that 3/16 is closer to 5/32 than to 1/4, 5/16 or 3/8. About two-thirds could add 1/2 + 1/3 and get 5/6. Multiplying the unit fractions 1/2 x 1/4 was easier: almost three-fourths of the 17-year-olds gave 1/8 as their answer.

The majority of 17-year-olds can do easy computations involving negative integers. More than 75% of the students correctly added (-5) + (-9), but fewer than two-thirds correctly multiplied (-2) x (-3). About half of the 17-year-olds knew both that the sum of two negative numbers is negative and that their product is positive.

Many 17-year-olds had difficulty making conversions from one unit of measure to another. Fewer than two-thirds were able to make conversions using pints and gallons, pounds and ounces, and yards, feet and inches.

Some geometric figures are recognized by most 17-year-olds, but they do not know many other geometric facts. Nearly all the students named a circle, 75% named a cone and about 50% named a cylinder. Fewer than one-half named either a cube or a sphere. About 75% knew that the diameter of a circle is twice the length of a radius. Fewer than 40% could bisect an angle using a straightedge and compass. Slightly more than one-fourth of the 17-year-olds found the area of a square with a perimeter of 12 inches.

Many 17-year-olds can solve easy equations or inequalities. For example, three-fourths of the 17-year-olds found the value of $x^2 \times 1$ when $x = 3$. The same number of students solved $3x - 3 = 12$. Most 17-year-olds correctly determined that if $(x < 4)$ then $(x + 7 < 11)$. Manipulating simple algebraic expressions was more difficult than solving simple equations. For example, fewer than 30% could simplify the expression $(r + s) - (r - s)$ to $2s$. Fewer than half were able to choose the graph representing $y = x$.

Seventeen-year-olds did not understand either probability or statistics very well. Only about one-fourth gave .50 as the probability of tossing a head on the next coin toss if the previous three tosses have been two heads and one

tail. Sixty percent of the 17-year-olds knew that if several coins were tossed at the same time, the most likely single event would be half heads and half tails. About half were able to determine the probability of drawing a particular ping-pong ball from an assortment. Two-thirds of the 17-year-olds could compute a simple average, but fewer than one-fifth could calculate a weighted average. Fewer than 20% identified the median of a series of numbers.

Seventeen-year-olds can do very simple word problems. Most found that a car could go 154 miles on seven gallons of gas if the car delivers 22 miles per gallon. However, fewer than two-thirds correctly figured that it takes 5.5 hours to travel 275 miles at an average speed of 50 miles per hour. About the same number of 17-year-olds were able to give the difference between temperatures of 31° and -7°, About 20% said 24 or -24 degrees. Only about 25% of the students could correctly convert 77° Fahrenheit to 25° centigrade, even though they were given the conversion formula to use.

In summary, most 17-year-olds have mastered the basic arithmetic operations. They are familiar with basic facts and terminology of geometry. More students can multiply fractions than can add them. The majority can solve straightforward word problems that call for addition, subtraction or multiplication of whole numbers. The majority of 17-year-olds do not understand probability, but they can compute a simple average. When asked to find solutions to problems that involve more than one step, few of the 17-year-olds are successful.

Science: Age 17

Few 17-year-olds know a variety of facts about the earth and the universe. One-fourth of the students realized that it takes approximately eight minutes for light to reach the earth from the sun, and only 10% knew that it takes five years for light to reach the earth from the nearest star other than the sun. About the same number knew that the earth has its own satellite but that that is not one of the reasons earth is classified as a planet. About half of the 17-year-olds could use an apparatus to demonstrate the daily cycle of earth; about 60% could demonstrate the yearly cycle of the earth. Less than 10% knew oxygen and silicone are the two elements making up the greatest part of the earth's mass.

Most 17-year-olds understood basic facts about disease, nutrition and the human body. About 80% knew insulin is used to treat diabetes, and almost 60% identified cancer as uncontrolled cell division. Nearly every 17-year-old (97%) knew a green or yellow vegetable should be added to a meal of milk, bread and butter, meat and cake. Fewer correctly answered questions about human reproduction. For example, only about half knew that the embryo normally develops in the uterus. Only 30% knew the egg is usually released 14 days after menstruation begins in humans.

The majority of 17-year-olds knew some basic facts about plants and animals. For example, most identified "lizard" as the animal, when given the choices of bacterium, lizard, moss, snapdragon and toadstool. About 70% knew that a frog is a vertebrate, and many could name parts of plants. Only 15% understood that giving a large amount of mineral fertilizer to a house plant will decrease the amount of water in the roots and may cause the plant to wilt and die.

Many 17-year-olds are not familiar with basic facts from physics and chemistry. Even though most recognized "protons, neutrons and electrons" as the particles that are usually said to make up atoms, only about half knew that electrons are the particles most directly involved in forming chemical bonds. Just over half knew that the burning of wood in air is an example of oxidation, only 10% of the 17-year-olds knew that water vapor is produced when a candle burns and 20% incorrectly thought that hydrogen gas is produced.

Very few 17-year-olds understand quantitative physical relationships. Half knew that the time required for a pendulum to make a swing depends on its length. When given a speed of an object which had been accelerating at a constant rate for five seconds after starting at rest, fewer than 25% of the 17-year-olds could calculate the acceleration of the object. Fifteen percent correctly identified the graph showing the relationship between pressure and volume of a gas at a constant temperature.

Varying numbers of 17-year-olds are familiar with generally-useful scientific facts and skills. Almost all knew about weather maps. About two-thirds were aware that white buildings are advantageous in hot climates because they reflect light. Only about 40% of the 17-year-olds knew that refrigerators work by transferring heat. About 80% of the 17-year-olds knew how to use a thermometer. Although 70% realized that the temperature of a mixture of equal amounts of hot and cold water would be somewhere between the hot and cold temperatures, only one-third knew that the temperature of the mixture would be the <u>average</u> of the two temperatures.

In summary, the majority of 17-year-olds know a number of facts about a variety of science topics. They know basic facts about disease, nutrition, the human body, plants and animals. In addition they know some generally useful science-related facts. They have difficulty with earth science and astronomy -- for example, only about half can use an apparatus to demonstrate the daily cycle of the earth. Seventeen-year-olds are basically unfamiliar with concepts from physics and chemistry.

Career and Occupational Development: Age 17

Seventeen-year-olds seem to have some basic knowledge about common jobs. Almost all knew social workers spend a great deal of time helping people with family and personal problems. Three-fourths knew which jobs usually involve labor union membership. However, only about 62% of the 17-year-olds knew that plumbers require more training than manicurists, assembly line workers or truck drivers. Half of the students could identify pictures of job settings for nine different jobs.

Most 17-year-olds had held a paying part-time job; about 25% had held their job for a year or longer. Service jobs, such as babysitting and working as a waiter or waitress, were among the most common jobs reported. Although almost all named at least two chores that they regularly did at home, fewer than half said they had worked without pay outside their homes.

Nearly all 17-year-olds said they had thought about the kind of job they would like in the future. Seventy percent said they had talked with someone other than friends about their career plans. Nearly two-thirds had discussed job plans with their parents and one-third had talked to a school counselor

or advisor. Only 40% of the 17-year-olds were aware of having taken an aptitude test, and only 16% remember discussing the test results with anyone who could advise them about careers.

Most 17-year-olds know a career they might like to have, but many may be disappointed with their choice. For example, there are not enough professional positions available in the country to accommodate the 44% who stated they want professional careers.

Most 17-year-olds could list five things to think about when choosing a job or career. Most mentioned pay as a consideration, and most would consider their personal goals before taking a job. Although half of the 17-year-olds had some difficulty in naming the skills or abilities they would need in the job of their choice, almost three-fourths knew several ways to find out more about jobs they were interested in.

It appears that most 17-year-olds are willing to acknowledge responsibility for their actions. More than 80% felt that they would be responsible if their neglect contributed to an accident to a worker who was in a place where he did not belong. Most (86%) would use some legitimate means to change an unfair rule where they worked, such as discussing the rule with a supervisor in the company.

In summary, 17-year-olds know the duties and educational requirements of a number of jobs. They also seem to know something of their own abilities and desires. However, they do not seem to have comprehensive information about requirements in the world of work or their own skills and abilities. They turn most frequently to their parents for advice. Only a little more than one-third had discussed their plans with school counselors. Finally, they do not seem to be very realistic in their aspirations.

Citizenship/Social Studies: Age 17

Seventeen-year-olds are generally tolerant and understanding of others. They said that they are willing to have people of different skin colors be their friends and that families of different skin colors should be able to live in any neighborhood. In response to a picture of a rundown neighborhood, 94% thought something should be done about the situation, and most expressed concern for the physical and psychological welfare of the people. Over 90% agreed that sex, religion, skin color and political opinion should not be determining factors in getting a job.

Although 17-year-olds profess open social attitudes, they are not very knowledgeable about the contributions of minority people to our nation. Two-thirds were able to name three famous blacks and one-third could name two famous Indians, but most were unfamiliar with famous Orientals or Spanish-speaking Americans.

Seventeen-year-olds support political and legal equality. They feel everyone's vote should count equally (regardless of sex, education or affluence) and believe politicians should be responsive to the needs of minority groups. Seventeen-year-olds repeatedly supported freedom of the press, speech, assembly and petition and the right to a fair trial no matter who was involved or what the circumstances were. They had somewhat less understanding of religious freedom, particularly for elected officials. Only half support the right of individuals to picket.

When asked why society has rules and regulations, 84% stated a plausible reason. The most frequently-mentioned reasons were the protection of life and property. Almost all favored laws against vandalism and supported the

idea that others should do something to prevent vandalism. Somewhat fewer (70%) said they would become involved themselves.

In addition to supporting the individual rights and beliefs of others, most 17-year-olds feel that they should not conform to peer pressure and that they should be involved in decisions that affect them personally. Ninety-six percent knew a law can be changed, and just as many felt an unfair law should be changed. Although 75% named at least two things that could be done about a law they considered unjust (most suggested contacting an elected official), only 55% said that they had ever helped to change a school rule. Most 17-year-olds said they were encouraged to make up their own minds and to speak freely in school. They also felt free to disagree with their teachers and said they helped make decisions in their school.

Course work in classes related to politics seems to be an important factor in performance. Those students who had discussed and studied political issues frequently outperformed other students on all types of political knowledge and attitude items. Sixty-three percent of the 17-year-olds said they discussed national or local politics in their classes three or four times a month, and 61% said they discussed international politics as often. Ninety-one percent said they had taken a course in politics and 79% said that their interest in politics had been increased by the course. More than 90% felt their courses attended to important political issues and most thought they learned new things in the courses. About three-fourths thought they were getting the knowledge they needed to participate politically in society.

In fact, considering that they are almost of voting age, 17-year-olds demonstrate rather disappointing political attitudes. Very few 17-year-olds

said they like to watch television programs about elections and politics and only two-thirds thought it important to vote under all circumstances. Only 57% indicated they were interested in learning about government.

Many students have the inclination and the ability to obtain information about political and social issues. A majority of 17-year-olds could think of questions to ask political candidates as well as ways to find out the basic reasons for a candidate's position on an issue. Eighty-four percent were able to identify three social problems, most citing pollution, over-population and crime. They said they wanted to ask questions about these problems and many were able to name sources that could be useful in answering their questions.

When interpreting information, most 17-year-olds can recognize a generalization that goes beyond the information given, distinguish fact from opinion and identify the unstated assumption of an argument. Almost all could infer the message of political cartoons and find some social implications in pictures and poems, even though, surprisingly, most took songs literally. Finally, most 17-year-olds were able to read and interpret information presented in different types of graphs.

Seventeen-year-olds do not perform as well on knowledge items as they do on attitude or skill items. They did know that the federal, state and local governments have different functions and what some of those functions are. They also knew, when asked in multiple-choice questions, that senators are elected, the Supreme Court declares laws unconstitutional and that the President does not make laws. Yet when asked to write their own answer to a question about how Congress could stop the President from sending troops abroad, half responded that Congress could declare the law unconstitutional.

Only 22% said Congress could cut off appropriations. It was also found that about half the 17-year-olds did not know that each state has two senators, that the number of representatives varies with the population of a state, that Congress has the power to pass laws about taxation, that presidential candidates are nominated at national conventions and that the President does not appoint people to Congress. Although 75% of the 17-year-olds knew there can lawfully be more than two political parties, only one-third knew that the U.S. Constitution says nothing about the role of political parties.

Seventeen-year-olds understand that equal rights are guaranteed in the Constitution. Over 80% knew Congress could not establish a national church or pass a law limiting freedom of the press. They knew that the President cannot restrict the media. About 75% understood that everyone, including the President and army generals, must obey the law. Fourteen percent, even after Watergate, did not think the President must obey the law.

Most 17-year-olds have a basic understanding of the court system. They were familiar with the rights of the accused and supported the right to a trial. Ninety-four percent knew that the function of a trial is to determine guilt or innocence. About three-fourths of the students knew about some jurisdictional powers and limits of courts, although only half realized that one can refuse to give testimony that might incriminate oneself.

Seventeen-year-olds do not understand basic economic concepts. They knew that a lack of funds will lead to poverty, and, as was stated earlier, they were sympathetic to those who live in poor conditions. But less than half could suggest ways to fight poverty or knew the reasons for it. On more technical questions about economics, the results varied. For example, 81%

knew the difference between producer and consumer goods, and over half knew the major attributes of an industrial society. However, only 21% knew that farm prices seek their own level in a free-market system.

Seventeen-year-olds have difficulty in applying their knowledge on several geography questions. Besides the fact that they had more difficulty reading maps than they did reading charts and graphs, they were inconsistent in answering questions about geographic relationships. When asked why tribal allegiances remain strong despite movement toward nationalism in Africa, the students tended to forget the relationship between the physical and cultural environment. Only 10% mentioned physical isolation as a reason. When asked what effects highway construction would have on a neighborhood, 82% could give two specific effects (less than half could give three), most of them disadvantages.

In summary, it is clear that 17-year-olds have learned what social attitudes are acceptable. They tend to agree with equal opportunity for all, to be sympathetic and tolerant and to be interested in social problems such as crime and poverty. While not claiming high interest in politics, they nevertheless evidence a basic belief in the right to participate and have some of the knowledge necessary for informed political participation. They are aware of the rights guaranteed in the Constitution and have a basic understanding of the court system.

Reading: Age 17

Nearly all 17-year-old students are able to read and understand information presented in a brief factual format. For example, about 90%

of the students could read a simple newspaper notice announcing a job opening and answer questions about the type of job being offered, qualifications needed for the job and whom to contact. The same proportion of students could use a simple table translating American clothing and shoe sizes to European sizes and determine the origin, destination and cost of a long-distance call from a telephone bill. About 90% were also able to read a single simple sentence and select another ordering of the same words having the same meaning as the original sentence.

Fewer students could answer questions based on a literal reading of more complex, yet common, types of reading material. About three-fourths of the 17-year-olds were able to read and understand information given in various kinds of written directions. For example, they could find the number to dial for long-distance information in a telephone book, determine the fine for parking overtime on a parking ticket, understand the qualifications for filing as single or married from income tax form instructions and tell how much to feed a kitten from instructions on a cat food label. Although 75% of the students understood that if they signed up for a book club membership they must buy a certain number of additional books, only about 60% understood a longer, more complicated set of fishing regulations or telephone-book information telling the kinds of long-distance rates effective at different times of the day. Between 50% and 60% of the 17-year-olds correctly answered each question about a difficult passage that briefly discussed the Supreme Court.

All of the tasks described previously required the 17-year-olds to answer questions about the literal meaning of what they read. Other tasks required them to make inferences. About 80% of the students had sufficient inferential

reading skills to understand a newspaper cartoon about high school dropouts and about unemployment. The same proportion understood the message conveyed in a public service advertisement about hiring mentally retarded persons.

However, there were other inferential reading tasks that were not as easily accomplished by the students. About two-thirds of the 17-year-olds correctly identified which one of four sentences was not related to the others because it was about a somewhat different topic. Half of the students selected the most appropriate title for a three-paragraph story about explorers at the South Pole, and the same proportion correctly inferred the author's message in a long paragraph about the importance of studying the behavioral and social sciences.

There are certain reading skills that students must have in order to select appropriate reference sources and locate information in these sources. Most of the 17-year-olds (85%) correctly determined which word in a list would be found on a dictionary page with given guide words. About the same proportion could read a map legend and determine which country controlled a land area. However, only 78% realized that the same map legend did not give enough information to answer a second question. Three-fourths of the students could read an alphabetical list of topics with page numbers similar to a book index and determine which topic would come first in the text of the book. Over half (60%) of the students could read a card from a library card catalog and ascertain the topic of the book.

From one-third to one-half of the students were able to identify the author's intent or the main idea after reading passages selected from articles or textbooks likely to be read by college freshmen.

In summary, many 17-year-olds can read and understand the literal meaning of information presented in short, straightforward materials. However, if the amount of material to be read is increased the proportion of readers able to answer literal questions about the material drops off. Long selections with unusual subject matter or vocabulary are clearly the most difficult type of material to read either literally or inferentially.

Literature: Age 17

Most 17-year-olds are familiar with a wide range of literary characters and works. For example, 93% identified allusions to Samson and Noah, 87% recognized Moby Dick, 65% identified a parody of "The Village Blacksmith" and 81% described the story of the Trojan Horse. Fewer (35%) were familiar with the Biblical story of Job.

Of all the items in the literature assessment, those dealing with elements of literary language were easiest for 17-year-olds. Almost all could choose the most appropriate line to complete a poem, and most were able to read and answer questions about metaphors. However, 17-year-olds had difficulty recognizing puns.

It is interesting to note that 79% of the 17-year-olds felt literature is of great value and 90% felt it should be taught in every school. However, only about two-thirds were able to give reasons for their attitudes. The most common reason given was that literature helps us understand history, other cultures and our society. Other reasons given were that literature helps our language skills, exposes us to other points of view and can lead to a greater self-awareness.

Although they were able to state specific values of literature, the 17-year-olds were unlikely to discuss literary works in those terms. For example, when students were interviewed after reading and listening to the poem, "The Closing of the Rodeo," only about one-third made any statements that were considered to be more than superficial. About half gave vague or brief evaluative comments ("It was good."), and one-third noted some trivial aspect of the poem ("It rhymes."). Many gave brief expressions of feelings ("I don't like cowboys.").

Even fewer 17-year-olds were able to discuss a poem in writing. For example, even though almost all the written responses to the A. E. Housman poem, "A Shropshire Lad," were primarily interpretive, only 19% demonstrated an understanding of the poem. Seventeen-year-olds responded more thoughtfully when asked to write their reactions to the story, "Snake Dance." Nearly half (44%) of the students gave meaningful responses.

Even though 17-year-olds could give a variety of reasons for reading, the survey of their reading habits indicated that they read mostly for entertainment. When asked whether they had read eight particular types of literature, those who said "yes" were asked to provide specific titles. While 69% could provide titles of novels and 52% could provide titles of biographies, only about 30% could name plays, and 25% could name poems. Over half of the novels were popular fiction, 13% were young adult classics and only 5% were considered to be enduring works of fiction for adults. On another survey question, 17-year-olds were asked about five types of literature read during the last 12 months. They were asked to provide the title and a description of the book. The results were similar to results on the first question, although fewer were able to describe a biography and a few more were able to describe a poem.

In summary, 17-year-olds can read and understand certain elements of literary language. They know what can be gained from reading literature and say that literature should be taught in all schools. They are familiar with a variety of literary works and characters. A survey of reading habits indicates that although 17-year-olds do not read extensively outside of school or read a wide variety of literature, almost all report that they do some reading on their own -- mostly popular novels. However, when asked to discuss a literary work, either orally or in writing, less than one-third of the 17-year-olds are able to find meanings or evaluate the work with much reflection or understanding.

Writing: Age 17

Seventeen-year-olds cannot write well in an unstructured, non-directive situation. In a task designed to determine which structural and organizational methods they would adopt, students were asked to listen to a recording of Scott Joplin's "New Rag" and write about "whatever the music brought to mind." Although one-fourth of the 17-year-olds organized information around topics and 10% connected bits of information, the majority responded with lists of unelaborated items, making no effort to link statements to each other.

When asked to become part of an imaginary situation shown in a picture, 17-year-olds were more successful. Ten percent of them wrote carefully-developed papers with definite moods and made no serious errors in composition. Over half of all of the papers were organized with strong lead sentences and clear transitions and were elaborated through imaginative, controlled use of detail.

Some 17-year-olds are able to write descriptive and argumentative essays. Over half the students were able to choose a side of the proposition "A woman's place is in the home" and defend their position with supporting arguments and logical reasoning. A majority were able to write an essay describing "something worth talking about." Three-fourths of the paragraphs in the essays were well-developed. The sentences and ideas were clearly ordered and the relationships among ideas clearly stated. About 60% of the essays were rated good or excellent.

Short, explanatory writing tasks are the least difficult for 17-year-olds. When asked to write a note to a grocer who had sold bad fruit to a child, 80% explained the problem and proposed some type of solution. About two-thirds took the opportunity to revise their notes; over half of them made informational and stylistic changes. Only about one-third tried to change the note's tone. Most changes made the original tone more extreme.

Seventeen-year-olds have some difficulty writing a job application letter in response to an advertisement. Most stated the job they were applying for and gave rather general descriptions of their qualifications. However, only about one-third provided either a phone number or a return address at which the employer could contact them. Most students included a greeting, closing and signature in their letters, but fewer than one-third included an inside address or a date.

Most 17-year-olds have learned writing mechanics skills. They did not use sophisticated vocabulary in writing -- the average word length was four letters. However, they did tend to write fairly long essays (nine sentences, 137 words) with many sentences containing phrases. One-third of the sentences

were complex constructions. A typical essay was not likely to contain any sentence fragments, but it usually contained a run-on sentence and one or two awkward sentences.

In summary, over half of the 17-year-olds have learned to write competently in a variety of situations -- some can even write with sophistication. On the other hand, about 10% do not have a basic command of writing skills. Another third have not learned how to amplify or develop an idea in order to communicate it clearly and fully. Many do not carry their explanations far enough; others elaborate extensively on their statements, but the details are not presented logically.

Music: Age 17

Seventeen-year-olds performed a variety of musical tasks that required them to perceive, reproduce and invent rhythmic, melodic and harmonic patterns. Nearly all 17-year-olds could improvise a rhythm to accompany an instrumental selection or maintain accurate rhythm when singing "America." They accomplished this just as well singing on their own as they did when accompanied by a chorus of voices.

They were less successful with pitch patterns than they were with rhythm patterns, and, as might be expected, they found harmony more difficult that melody. For example, only two-thirds of the students could accurately sing the melody of "America" with accompaniment and less than half of the students were able to improvise an appropriate melody as an ending phrase for an unfamiliar introductory phrase. Less than 20% were able to improvise or

repeat a harmonic line of music. About 20% were able to sight-sing from a printed piece of notation with acceptable rhythm and pitch.

About 25% of the 17-year-olds played musical instruments. When asked to play a selection of their own choice, most gave an adequate or good performance. More than half the instrumentalists played keyboard instruments; about one-third played folk instruments; and about 15% played brass, woodwind or percussion instruments. On sight-reading tasks, the instrumentalists were able to produce correct pitches more often than correct rhythms. Nearly all students who did not know how to play an instrument said they would like to learn.

Although over half the 17-year-olds believed that playing an instrument in a small or large group is enjoyable, only 10% belonged to an instrumental group. Most said they enjoyed singing in either small or large groups, but only 20% of the students belonged to a singing group.

Almost all 17-year-olds are familiar with the sounds of common instruments such as trumpets and pianos. Over 90% knew whether certain instruments are played by blowing, striking or plucking. The instrumental sound least familiar to the students was that of the harp, and few (20%) recognized the oboe and bassoon. However, about 40% could circle all of the bassoons and cellos in a picture of an orchestra seating plan.

Three-fourths of the 17-year-olds knew the names of notes and certain musical symbols. About the same proportion could follow a line of musical notation while listening to the music and mark where the music stopped. However, only about 30% of the students knew that two eighth notes equal one quarter note, and the same number could detect a discrepancy in pitch between a musical score and a recording.

About 60% of the students recognized that two pieces of music were different because they had different rhythms. Only 40% recognized differences due to changes in melody or harmony. Two-thirds of the 17-year-olds recognized style similarities between two pieces composed by the same person. About two-thirds recognized the correct order of five periods in music history and knew that Beethoven's "Symphony No. 5" was from the Romantic period. Only 30% knew the name of the Beethoven symphony.

Most 17-year-olds knew the names of the pieces, "This Land Is Your Land" and "When the Saints Go Marching In," and about half knew "America the Beautiful." About half also knew that Sousa wrote the "Stars and Stripes Forever," but only one-fourth knew that the "Messiah" was composed by Handel.

Most 17-year-olds listen to music on the radio or on records or tapes several times a week. Rock music was clearly their favorite; less than 5% of the 17-year-olds said that they liked to listen to country-western, jazz, folk or classical music.

In summary, most 17-year-olds know the sounds of instruments and how the instruments are played. About half can maintain melodic patterns while singing and nearly all can maintain rhythm. In contrast, instrumentalists are able to maintain pitch more accurately than rhythm. Only about one-fourth of the students have a good understanding of musical notation. Most 17-year-olds like listening to music and participating in musical groups, even though most of them do not belong to organized groups. Nearly all of the students who do not know how to play instruments say they would like to learn.

Art: Age 17

At the present time, results are available for two drawing-skill tasks from the art assessment.* One task asked for an artistic design and the other for a perspective drawing. In the first task, the students created a design to fit the shape of a bedroom wall with an off-center door. The designs were given points for three major elements: fitting the shape of the wall (60% of the drawings met this criterion); coherent integration of design elements (48% met this criterion); and integration of the door into the overall design (21% met this criterion). Of the 61% of the 17-year-olds who were given enough points to receive an overall "acceptable" rating, nearly all succeeded in fitting their design to the shape of the wall. Each drawing was also scored for imagination. One-fourth of the designs contained unusual or surprising elements such as objects drawn in an unusual scale or objects not normally found in a bedroom wall design.

The perspective drawing task measured the student's ability to use a combination of perspective techniques to draw a picture of four people seated at a table. Altogether there were 14 perspective characteristics on which each drawing was scored. In order for a drawing to successfully show perspective, it had to contain at least 7 of the 14 characteristics. Fifty-one percent of the 17-year-olds were successful on this task.

In scoring the perspective drawing, credit was given for using converging lines, overlapping objects, making near objects larger than far objects and

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*National Assessment reports about knowledge of art history and about attitudes toward art will be available later this year.

placing objects higher or lower on the picture plane. About two-thirds of the 17-year-olds drew the table overlapping a figure, and the same proportion placed the more distant figures higher on the picture plane. Only about 30% of the drawings showed the back legs of the table and chairs drawn shorter than the front legs. In about half of the drawings an appropriate set of converging lines was used to show perspective in the table top. Thirty percent of the students drew the table from either a bird's-eye view or an eye-level profile view. Another 14% drew diverging lines that reversed the perspective.

In summary, almost two-thirds of the 17-year-olds have the artistic skills necessary to create an integrated design. About half are able to successfully draw in perspective. Fewer students are able to use the technique of converging lines than are able to use overlapping objects and higher and lower objects to show distance.

Highlights of What 17-Year-Olds Know and Can Do

The following statements summarize the findings of what many 17-year-olds (more than two-thirds) know and can do.

- Many can add, subtract, multiply and divide whole numbers and decimals.
- Many can add negative whole numbers.
- Many can multiply fractions and reduce them to lowest terms.
- Many can calculate a simple average.
- Many can name geometric figures and know that the diameter of a circle is twice the length of a radius.
- Many can evaluate simple algebraic expressions and solve first-degree equations and inequalities.
- Many can solve simple word problems requiring multiplication.
- Many know the names of the particles which make up an atom.
- Many understand some facts about nutrition, illness and disease.
- Many know facts about plants and animals.
- Many know that the color white reflects more sunlight than other colors.
- Many can use a thermometer.
- Many know the job responsibilities of common jobs and careers.
- Many know which jobs usually involve union membership.
- Many know things to consider when choosing a job or career.
- Many have thought about their future jobs and discussed their plans with persons other than friends.

- Many know ways to find out about careers.
- Many have worked for pay outside of their own homes.
- Many say they are willing to accept responsibility for their actions.
- Many know acceptable methods of dealing with unfair rules at work.
- Many understand and support the rights guaranteed by the U.S. Constitution.
- Many believe that people should not be denied jobs because of race, sex, religion or political opinions.
- Many think run-down neighborhoods should be improved.
- Many know reasons for societal rules and regulations.
- Many know that unfair laws can be changed and believe they should be changed.
- Many say they would try to prevent vandalism.
- Many know that there can legally be more than two political parties.
- Many understand some functions and limits of the executive and judicial branches of government.
- Many know that pollution, overpopulation and crime are social problems.
- Many know the difference between producer and consumer goods.
- Many can read and understand short, straightforward materials such as newspaper ads and telephone bills.
- Many can read and understand directions and instructions.
- Many can infer social implications from newspaper cartoons.
- Many have three-letter alphabetization skills needed for using guide words on dictionary pages.
- Many can use a map legend and book index.
- Many feel that reading literature is important.

- Many are familiar with well known literary works and characters.
- Many are familiar with the elements of literary language.
- Many read novels outside of school.
- Many can give a general description of their qualification in a job application letter.
- Many know letter-writing conventions.
- Many can write a note explaining a problem.
- Many have mastered the mechanics of writing.
- Many can improvise rhythms and maintain accurate rhythms while singing.
- Many recognize the sounds of common musical instruments and know if the instruments are played by blowing, plucking or striking.
- Many know musical symbols and terms.
- Many know that Beethoven's "Symphony No. 5" is from the Romantic period.
- Many believe that group singing is enjoyable.
- Many listen to music several times a week.

The following statements summarize the findings of what some 17-year-olds (approximately 33% to 67%) know and can do.

- Some can convert decimals to common fractions.
- Some can add fractions.
- Some can multiply two negative integers.
- Some can convert measures for volumes, weights and lengths.
- Some can bisect an angle using a straightedge and compass.
- Some can recognize the graph for $y = x$.

- Some can determine the probability of randomly drawing a particular ball from a jar.
- Some can solve word problems involving subtraction with negative integers or division with decimal answers.
- Some know that electrons are involved in forming chemical bonds.
- Some know that cancer is uncontrolled cell division.
- Some know about human reproduction.
- Some know that wood burning is an example of oxidation.
- Some know that pendulum length controls the time required for a swing.
- Some know that the temperature of a mixture of equal amounts of hot and cold water will equal the average of the two temperatures.
- Some can use an apparatus to demonstrate the daily and yearly cycles of the earth.
- Some know the lengths of training periods for some jobs.
- Some know what various job environments look like.
- Some have taken aptitude tests.
- Some aspire to professional careers.
- Some are interested in learning about government and believe that voting is important under all circumstances.
- Some know each state has two senators and that the number of representatives varies with state population.
- Some know congress passes tax laws.
- Some know that political parties are not mentioned in the U.S. Constitution.
- Some know that people can refuse to testify on the grounds that they might incriminate themselves.
- Some know ways to fight poverty.
- Some know how to find the reasons for a political candidate's position on an issue.

- Some can read and understand detailed instructions and regulations.
- Some can select an appropriate title for a three-paragraph story.
- Some can make inferences after reading a long paragraph.
- Some can read a college-level article and identify the intent or main idea of the article.
- Some read biographies outside of school.
- Some can express feelings in writing.
- Some can organize and elaborate ideas in writing.
- Some can argue persuasively in writing.
- Some can improve their own writing by revising it.
- Some include an address or telephone number at which they could be contacted in a job application letter.
- Some can sing a familiar melody.
- Some can improvise a melody.
- Some are familiar with music notation.
- Some can create an artistic design.
- Some can show perspective by drawing converging lines, overlapping objects or objects placed higher or lower in the picture plane.

The following list summarizes the findings of what few 17-year-olds (less than one-third) know and can do.

- Few can calculate the area of a square given its perimeter.
- Few can simplify algebraic expressions.
- Few understand probability or statistics.
- Few can convert Fahrenheit to centigrade given the conversion formula.

- Few know how long it takes for light to reach the earth from stars.
- Few know that oxygen and silicone make up most of the earth's mass.
- Few understand quantitative relations in physics and chemistry.
- Few know why a large amount of mineral fertilizer placed around a plant will cause it to wilt and die.
- Few know that water vapor is produced when a candle burns.
- Few have held a part-time job for a year or longer.
- Few have discussed aptitude test results with anyone who could advise them about career plans.
- Few know the functions of the legislative branch of government.
- Few know that farm prices seek their own level in a free market system.
- Few know geographic relationships.
- Few have read poems or plays outside of school.
- Few can thoughtfully evaluate poetry and prose.
- Few write excellent essays.
- Few can improvise or repeat a harmonic line of music.
- Few can sing from printed music with acceptable rhythm and pitch.
- Few play musical instruments.
- Few belong to a singing group.
- Few like to listen to country-western, jazz, folk or classical music.
- Few can show perspective by drawing objects larger and smaller to show distance.

Patterns of Group Results: Age 17

Regions

Southeast. Students in the Southeast had strong positive attitudes toward music and were heavily involved in music; they said that they read literature often; and they expressed strong political attitudes. In these areas, their performance was equal to or higher than that of the nation as a whole. Southeastern performance was the poorest of all four regions in all other learning areas except for science. In science, the performances of the Southeast and the West were about equally below the nation.

West. The average performance of students in the West was about the same as the nation in mathematics, literature, writing and career and occupational development. Their performance was slightly below that of the nation in citizenship/social studies, science, reading, art and music. The Western performance was above that of the nation on career and occupational development measures of manual perceptual skills, general job knowledge, self-appraisal skills and work-related experiences, on citizenship/social studies questions about social attitudes and on the art task measuring perspective drawing skills. In fact, the West had the best regional performance on the perspective drawing.

Central. Students in the Central region performed better than the nation as a whole in all learning areas except science, where their performance was

about the same as that of the nation. They performed better than the other three regions in reading, music, writing, career and occupational development and on the art design task. They had the second-best regional performance for the remaining learning areas and their performance was above the nation on all aspects of all learning areas with one exception. Interestingly, fewer young people from the Central region expressed acceptable social attitudes.

Northeast. Seventeen-year-olds in the Northeast performed above the nation as a whole in all learning areas except career and occupational development, where their performance was about the same as the nation. They outperformed the other three regions in citizenship/social studies, literature, science, mathematics and music.

Females and Males

Females. Female students outperformed males in all aspects of writing, music and reading. They also outperformed males on most aspects of literature. They were superior on exercises in other areas that required writing skills -- particularly career and occupational development job-related writing tasks and citizenship/social studies exercises requiring them to express their attitudes in writing. They outperformed the males on the art perspective drawing.

Males. Seventeen-year-old males outperformed females in all aspects of mathematics and science. Males tended to outperform females on knowledge items in career and occupational development and citizenship/social studies.

They also did well in recognizing literary works and characters and creating an artistic design for a bedroom wall.

Blacks and Whites

Blacks. Although black students generally performed below the nation, their deficiences were smallest for attitude exercises. Their performance on citizenship/social studies attitude exercises and music attitude exercises equalled that of the nation. They also did as well as the nation on music performance.

Whites. White students performed better than the nation as a whole in all areas assessed except those detailed above.

Size and Type of Community

The pattern of results among the size-and-type of community classifications was constant across all learning areas. Students whose schools were in high-socioeconomic metropolitan areas (high metro) always performed better than the nation as a whole. Students in low-socioeconomic metropolitan areas (low metro) performed worst. Low metro 17-year-olds were about equal to the nation on the artistic design task; they also performed better than usual on citizenship/social studies and literature attitude items. Seventeen-year-olds living in rural areas tended to perform slightly below the nation as a whole. Students living in small- and medium-sized cities tended to perform about the same as 17-year-olds nationally.

Level of Parental Education

The performance of 17-year-olds can generally be ordered from best to worst by going from the highest to the lowest level of parental education. However, the no-high-school and some-high-school groups performed the same in the area of writing and on job-related writing exercises in career and occupational development.

Changes in Educational Achievement: Age 17

At this time, National Assessment has completed reassessments of science. reading and writing. The results indicate national declines in science knowledge and writing performance but no real change in reading abilities.

Science Change

From 1969 to 1973 the proportion of 17-year-olds who knew the answer to the typical science question dropped by about three percentage points. The performance of students living in the Northeast and Central regions declined by about 3%, and the performance of 17-year-olds living in the West dropped by almost 4%. The performance of those living in the Southeast did not decline.

The performance of males and females declined by equal amounts. The performances of black students and white students also dropped about equally.

While the performance of the high metro group and low metro group declined about 4%, the performance of the extreme rural groups decreased only 1%. The performance for the main big city group declined by about 5%.

Reading Change

There was little change in 17-year-old students' reading skills between 1971 and 1975. No change occurred in study skills or literal comprehension.

There were small, statistically insignificant declines in the performance of the nation and most reporting groups in inferential comprehension. For female students and students whose parents were educated beyond high school, the declines in performance were small but statistically significant.

Writing Change

Information on change in writing performance at age 17 is based mainly on responses to a descriptive writing task. The essays were scored for sentence and paragraph structure and mechanical correctness, and they were also given an overall rating based on the quality of the whole essay, disregarding specific aspects of style, content or mechanics. On the average, the papers were of lower quality in 1974 than they were in 1969. In 1974 there were fewer average papers and more poor papers, while the proportion of good papers stayed the same. One specific symptom of the widening gap between good and poor writing may be the amount of writing. In 1974 there were twice as many short essays as in 1969. The good papers were almost four times as long as the poor papers.

In the 1974 papers the vocabulary (based on average word length) was somewhat simpler than the vocabulary had been in 1969. The essays contained a smaller proportion of complex sentences with phrases and exhibited a higher proportion of run-on sentences. In 1969, 85% of the paragraphs in an average paper were coherent, but in 1974 only 74% were coherent.

Changes in other aspects of writing were varied. Just over half of the 17-year-olds took down a telephone message accurately in both years. It appears that fewer 17-year-olds were writing letters in 1974 than in 1969. When asked about methods of transmitting information, fewer students in 1974 than in 1969 mentioned writing.

Conclusion: Age 17

Nearly all 17-year-olds have the basic skills required to read facts, compute with numbers and write correct English. They know numerous specific facts in all school subjects. They know what attitudes and behavior are expected of them in our society. Most 17-year-olds have the study skills necessary to go on learning after they leave school: they know about reference works and how to use them; they can separate facts from opinions and recognize assumptions; they understand written instructions. These findings suggest that 17-year-olds should be able to get along in life, but there is evidence scattered through all areas that 17-year-olds cannot do some important practical tasks. For instance, half cannot determine the long-distance phone rates for a particular time of day, read detailed regulations, convert measures and many cannot write a complete job application letter.

In general, 17-year-olds have difficulty organizing and applying their knowledge and skills. Although they can use these abilities in structured situations, they cannot use the same skills and knowledge when asked to demonstrate their skills, explain their reasoning or provide answers in new or unstructured situations. Many cannot do problems that require more than one step; some cannot organize their thoughts in writing; some cannot explain the reasons for their beliefs about literature or political candidates. They have difficulty reading long passages and have limited vocabularies.

A nagging doubt about 17-year-olds is whether or not they understand relationships between ideas and have internalized concepts necessary to deal with real-world problems. Even though most feel they are good readers, only half are able to read college freshman-level materials. Even though they know sophisticated reasons for reading books, most read popular fiction purely for enjoyment. Most have thought about their future jobs, but some have unrealistic career expectations. Fewer than one-third have talked with a counselor about their job plans. They all believe in social equality and changing unfair laws, but only half take part in school politics and only one-fourth watch television programs about local or national politics.

Some groups of 17-year-olds, such as those in the Northeast, those in high-socioeconomic metropolitan areas and those who are white, generally perform above the national level. Those living in the Southeast, those living in low-socioeconomic metropolitan areas and those who are black consistently perform below the national level.

Reassessments in science, writing and reading all indicate that 17-year-olds are not better prepared than those of three to five years ago. In science they are clearly less knowledgeable. Only Southeastern and rural students did not decline in science performance. Except for a slight decline in inferential comprehension skills, there was little change in 17-year-olds' reading skills. There was a significant decline in the overall quality of written compositions.